Does Credit Union Merger Benefit Members?

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Abstract

Abstract: During past few decades, due to financial deregulation, the banking industry experienced a considerable amount of consolidation. To study whether members benefit from a merger, we examined the impacts of mergers that took place in the U.S. from 2002 to 2015 on operating performance (profitability and cost efficiency), average loan and deposit interest rates, credit supply and loan portfolio. Employing propensity score matching strategy to mitigate possible selection bias, we did not find evidence that mergers provide benefits to members of the acquiring credit unions. Compared with the matched non-merging peers, acquiring credit unions obtain less improvement on profitability for the first year after the merger and also do not show any improvement in cost efficiency. Acquiring credit unions members do not attain any superior benefits on interest rates (neither deposit nor lending rate). Moreover, we observe a larger contraction in credit supply with a decrease in unsecured credit card loans and real estate loans, compared to what is provided by similar credit unions who do not go through mergers in the same period. Our study fills the gap of literature by attaching attention to member benefits in credit union mergers, especially in the regards of interest rates, credit supply and loan portfolio composition.

Keywords: credit unions, mergers, performance, interest rates, credit supply, loan portfolio, PSM

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1. Introduction

During the past few decades, both banks and credit unions experienced a considerable amount of consolidation. Wilcox (2006) argued that it became ambiguous for financial institutions to distinguish from each other because of the deregulation in the financial market, leading to further competitions between them. As a result, financial institutions started to merge to survive. Researchers have studied merger effects of commercial banks (Berger and Humphrey, 1992; Shaffer, 1993; Berger et al., 1997; Carletti et al., 2001; Sapienza, 2002; Prompitak, 2009; Haas et al., 2010; Behr and Heid, 2011; Ogura and Uchida, 2013; Beccalli and Frantz, 2013). However, similar attention has not been attached to the credit union mergers.

According to National Credit Union Administration (NCUA), the number of credit unions in the U.S. shrunk from 10439 in 2000 to 5492 in 2018, where smallest credit unions with less than 5 million went through a 79.2% decline. Despite the decrease in the number of credit unions, however, the number of members, total deposits and local market shares have increased. On average each credit union is expanding in size. Wilcox (2007) argued that this decrease in the number of credit unions is mainly attributed to mergers. As such, our focus is to study the impacts of a merger on the credit union, specifically on its membership.

Credit unions, as a financial institution, to a large extent are similar to banks. They take deposits, provide loans and offer a broad range of financial products to its customers. Taylor (1971) defined credit union as a rather unique social institution which serves both as a financial intermediary and as a cooperative. It gathers deposits from the members and lends these funds to its members, while it is also owned and operated by members on a volunteer basis. While credit unions and banks share a lot of similarities, they differ from each other in several ways. A major difference between them is the ownership. Compared to banks, credit unions do not have shareholders and they are owned by their members. It is the financial consumers themselves who form and join the credit unions and become members. They aim to obtain more extensive financial services which they cannot get access to otherwise, and/or cannot have these services at a more affordable price. Ever

since Jensen and Meckling (1976), influences of organization form on operating behaviours have been diffusely accepted, which suggests that the form determines the ownership of residual claims and the objective of the organization. Thus, as opposed to commercial banks, whose goal is to maximize shareholders' profits, the primary focus of credit unions is to benefit members by meeting their needs of financial services, in providing them access to credits, safekeeping their savings and returning profits in form of more attractive rates (Bauer, 2007; Goddard et al., 2008). While fee income is becoming increasingly important as in commercial banks (DeYoung and Rice, 2004; Abedifar et al, 2014; etc.), most credit unions would put a priority on providing consumer loans (Fried, Lovell and Yaisawarng, 1999; Goddard et al, 2002). As such, credit unions may have different strategies for interest rates, credit supply and loan composition from that of commercial banks.

The most probable objectives of credit unions been argued so far are to maximize asset growth and/or membership growth, to offer more financial products, or to maximize the difference between market savings and loans rates compared with what credit unions provide (Fried et al., 1996; Goddard et al., 2002; Smith 1984; Bauer 2008). Smith (1984) argued that the key decisions made by management team are the types of loan and savings accounts to offer, and the prices and/or quantities of those accounts, which implies that management team plays an important role in affecting the asset size. Dopico (2016) concluded four most effective ways (except consolidation) for credit unions to grow in size: increasing deposit benefits, attaining a higher return on asset, providing richer key financial products and making higher market expense contributed most to asset growth. At the same time, it is argued that the objective would be different across the sizes of credit unions (Goddard et al., 2008). Thus, we propose that merger, as an activity which influences both size and management team, should have a great impact on the credit union's credit supply, interest rate and loan composition.

Previous studies (Fried et al., 1999; Bauer et al., 2009; Dopico and Wilcox, 2010) show that, target credit unions have been proved to benefit from mergers where the benefits to

credit unions are represented by increase in efficiency score (Fried et al., 1999; Garden and Ralston, 1999; Ralston et al., 2001; Worthington, 2001; Bauer et al., 2009). But there is no evidence of efficiency gains to acquirers been found. In particular, we were interested to know whether the members of the acquiring credit unions benefit from the merger. This is particularly interesting for credit union since membership benefits are argued to be the goal of the credit unions (Smith, 1984). Member's benefits can be in the form of better rate (deposit/loan rate), access to credit or diversified loan offering. To our best knowledge, there is no literature available to study the impact of the merger on interest rates, credit supply and loan portfolio of credit unions; i.e. the benefit to the members. There are three major stakeholders of a credit union. One is members/owners, the second is the management team and the third is regulators and public. As evidenced by Bauer, Miles and Nishikawa (2009), regulators benefit from merger activities, indicated by better CAMEL ratios. Thus, we attached our main focus on whether members of the acquiring credit union benefit from consolidation.

As such, this study aims to fill the gap to investigate whether the members can benefit from a merger, by examining merger effects on performance, interest rates, credit supply and loan portfolio, from a perspective of the members of acquirers. We studied mergers that took place in the U.S. from 2002 to 2015. By simple comparison between acquirers' key variables before and after the merger, we observe decrease in total loan to asset ratio, decrease in new vehicle loans, decrease in other real estate loans, increase in business loans, decrease in profitability, increase in cost-to-income ratio, larger size, decrease in average loan interest rate, decrease in average deposit interest rate and decrease in net interest margin, which are all significant. In our sample, we observed that acquiring credit unions are generally larger and more profitable than those who were not involved in any mergers, as such a simple comparison may lead to selection bias. To avoid this bias, instead of simply comparing merged credit unions with those who didn't experience a merger, we employ propensity score matching method to match every acquiring credit union with a similar non-merging peer. We matched them in eight dimensions. We found that, compared to similar non-merging counterparts, acquiring credit unions obtained less improvement in

profitability one year after the merger while there was no difference in the subsequent year. For cost efficiency, we did not observe the difference between the acquirers and similar non-merging peers one year and two years after the merger. Merging credit unions do not attain superior benefits on interest rates. However, we observed a larger contraction in credit supply with a decrease in unsecured credit card loans and real estate loans, compared to what similar credit unions offer if they do not go through a merger. To conclude, this study does not find support for any superior benefits to members of the acquiring credit unions.

The remainder of this study is constructed as follows. In section 2 we will describe the background of credit union sector, and this section illustrates the trend and loan composition of recent credit unions, categorized by asset size. In section 3, we summarized previous literature with emphasis on credit unions and the merger effects, followed by hypothesis development in section 4. In section 5 we explained the data set and constructed variables. We also introduced our methodology and regression model in this section. Results are shown and discussed in section 6. Finally, we summarized and concluded in section 7.

2. Background

2.1. Credit union

A credit union is a not-for-profit organization and a member-owned financial cooperative, operated under the principle of people helping people. Originally from Germany and first established in the United States in 1909, credit unions focus on helping their members save and borrow at more beneficial rates as well as receive more affordable financial services than what they can expect from commercial banks.

Although similar services are also offered by commercial banks, credit unions differ from traditional commercial banks in several regards, including their member ownership, not-for-profit purpose, and average smaller size. The average credit union holds about $268 million in assets, while the average bank holds nearly $3.33 billion (CUNA U.S. Credit Union Profile, 2019)[1]. Besides, credit unions are designed to serve people sharing common attributes, such as the same geographic locations, similar occupations or membership in a certain group. These common attributes provide credit unions with additional soft information on their members and members' financial ability to pay back the loan, which makes credit unions able to provide more personalized services. Also, due to credit unions' not-for-profit characteristic, their profits will either be reinvested or given back to members through attractive interest rates, instead of going to shareholders (Goddard et al., 2002). Thus, unlike banks, maximizing profits of shareholders is not the primary goal for credit unions. Meanwhile, Taylor (1971) defined a credit union as a rather unique social institution, combining a financial intermediary with a member-owned cooperative, which is both a 'purchasing' cooperative and a 'marketing' one. Smith, Cargill and Meyer (1980) argued that, due to the fact that the members are both consumers and owners, credit unions cannot simply be applied with the profit-maximizing model, which was used to study

[1] U.S. Credit Union Profile, 2019. Retrieved from:

https://www.cuna.org/uploadedFiles/Global/About_Credit_Unions/NationalProfile-M19-Bank.pdf

commercial banks.

2.2. The recent trend of credit unions

Despite the differences mentioned above, Fried, Lovell and Yaisawarng (1999) argued that, among all the similarities that credit unions and banks share, there is one similarity that is worth noting: the urge to merge. In recent decades, the financial market has witnessed heavy consolidation. Wilcox (2006) argued that it becomes ambiguous for financial institutions to distinguish from each other because of deregulation in the financial market, leading to further competitions between them. Accordingly, like banks, credit unions are also under the pressure to merge for survival. From historical data, we can notice that although the number of credit unions is shrinking, the number of members, total deposits and local market shares are expanding. According to National Credit Union Administration (NCUA) and Credit Union National Association (CUNA), there were 11,992 federally insured credit unions at the end of 1994, while there are only 5,492 in 2018. The decrease in the number of credit unions can be attributed to mergers, conversions and liquidations (Wilcox, 2007). However, the data showed that credit unions converting to other charters from 1997 to 2005 only comprised less than 1% of credit unions while the failure rates were also less than 1%. Thus, merger activities are presumed to be the major reason for the decreasing number. Figure 2.1 below shows the change in the number of credit unions in different asset sizes. We categorized credit unions into nine sizes using the same asset size category following McKee and Kagan (2015).

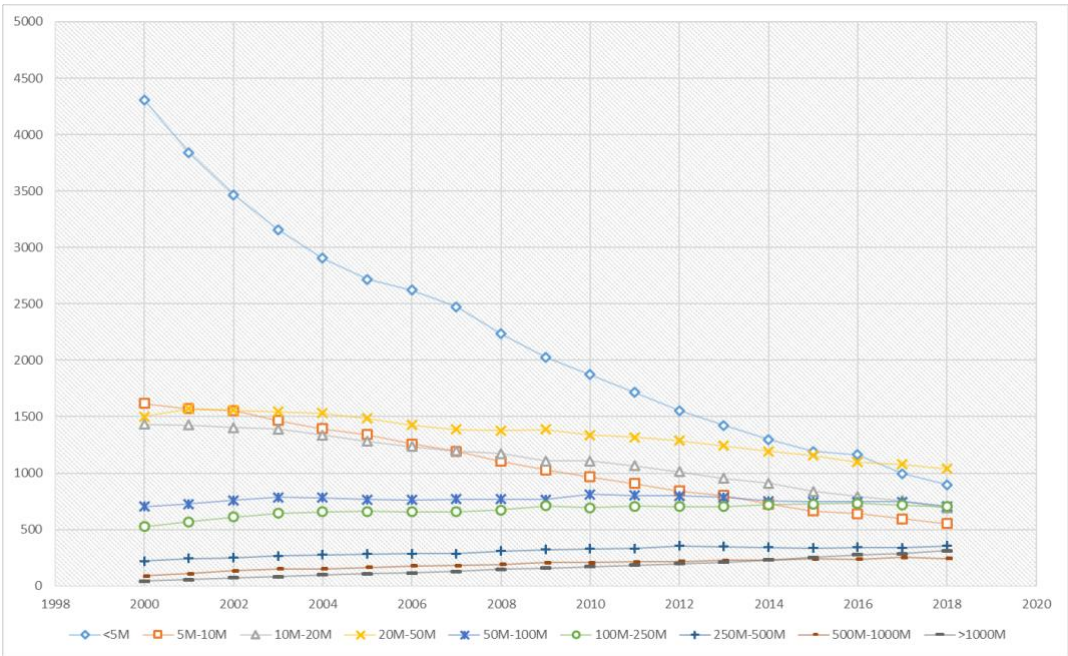

Figure 2.1 The change in number of credit unions in different size

As we can see from Figure 2.1, from 2000 to 2018, credit unions with smaller asset size decreased drastically. The number of smallest credit unions with asset less than 5 million decreased from 4307 to 896, experiencing a 79.20% decline. In contrast, the larger ones experienced a sharp increase. The number of the largest credit unions with asset more than 1000 million increases from 43 to 311, growing more than six times the original number. Meanwhile, the number of medium-size credit unions stays stable, with only 0.28% increase during the same time. The decreasing number of small credit unions and the increasing number of large credit unions can partially be attributed to the growth of smaller credit unions into large ones, primarily due to consolidation. However, as the total number of credit unions also reduced drastically during our sample period, from 10439 to 5492, merger activities were supposed to be the major reason.

2.3. The trend of credit unions' loan portfolio

The loan is the major asset of banks, thrifts, and other lending institutions. The original intention of a credit union is to provide members in similar financial conditions and

financial capacity with unsecured credits. Thus, loan provision, among other services, should be the most important service in credit unions (McKee and Kagan, 2015). Following Dopico (2016), we mainly focused on 7 key loan types defined by him. The 7 key loan types are unsecured credit cards, other unsecured loans, new car loans, used car loans, first mortgages, other real estate loans and business loans. Figure 2.2 and Figure 2.3 illustrate average loan portfolio for all the credit unions and the different compositions of the loan portfolio in three typical size categories of credit unions respectively.

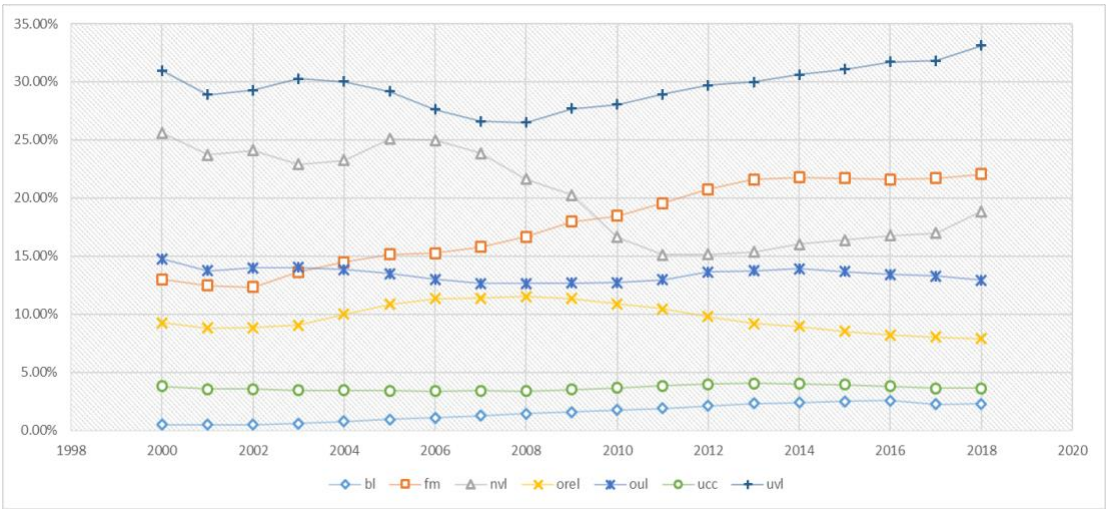

Figure 2.2 Average loan portfolio for all the credit unions

As a whole, from 2000 to 2018, used vehicle loans dominate the portfolio, taking up around 30% of the portfolio. Before 2009, new vehicle loans took the second place while first mortgages took the place over after 2009, each making up nearly one-fifth of the portfolio in 2018. Other unsecured loans and unsecured credit cards remained stable during this period while other real estate loans raised to peak at 2008 and then shrank after the crisis. However, business loans kept increasing during the same period, from 0.47% to 2.30%, nearly five times its original number. Our observation is in line with Dopico (2016), who also noticed that there is a change in the loan portfolio and summarized that the weights have long been shifting to mortgages and business loans.

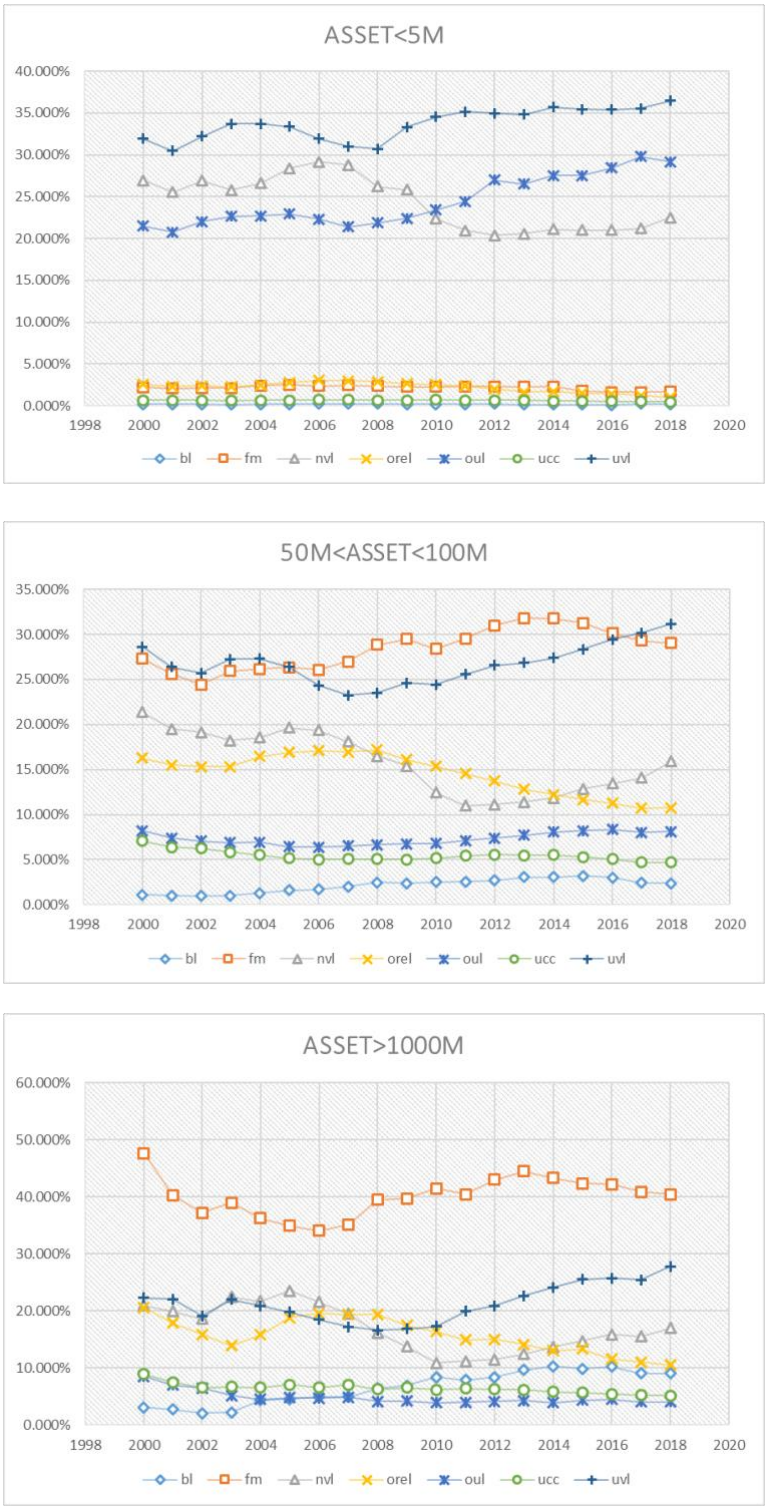

Figure 2.3 Different loan portfolios in different size of credit unions

As seen from Figure 2.3, we notice that the loan composition differs significantly across

asset sizes. With credit union growing in size, its major loan type changes from used vehicle loans to first mortgages. For the smallest credit unions, used vehicle loans, other unsecured loans and new vehicle loans are dominating the loan portfolio while little amount was given to business loans. For medium-size credit unions, first mortgages are catching up with used vehicle loans, followed by new vehicle loans and other real estate loans. Still, business loans are barely attached with emphasis. For the largest credit unions, first mortgages are becoming the major loan type, far exceeding the second and third types, which are used and new vehicle loans. Although other real estate loans dropped sharply after the financial crisis, it still remains the fourth largest loan category. Interestingly, business loans are growing a lot, and this loan type is no more the one with little focus. We can draw a conclusion that real estate loans and business loans are becoming more important as credit unions grow in size, while vehicle loans stably maintain their critical roles in the loan portfolio. That is, secured loans are taking a larger portion of the loan portfolio as credit unions become larger.

These differences may be attributed to some possible changes in regulatory constraints, changes in credit unions own ability to afford those large loans and changes of the management team, as types of the loan account, as well as prices and quantities of these accounts, are among the key decisions made by management team (Smith, 1984). Since merger activities have a direct influence on both asset size and management team, we argue merger activities would have a significant influence on loan portfolio composition.

3. Literature review

3.1. Size and credit unions' objectives

Size has long been an important factor for credit unions to realize increasing returns to scale, improve credit unions' performance and enrich products. Murray and White (1980), using operating-cost-minimizing model and testing 152 credit unions from 1972-1975 in British Columbia, found evidence showing the credit unions realize increasing returns to scale as expanding asset. Wilcox (2005a) concluded that the larger the credit union is, the richer the financial products it provides. McKee and Kagan (2015) noticed that the average size of credit unions increased 600% from 1989-2006, and they gave their focus on small credit unions and researched on the determinants of their recent structural changes. Using annual data from 1994-2011, they examined the effects of macroeconomic and the firm's internal changes on small credit unions with less than 10 million in asset. They found that there may exist an efficiency gap between small asset credit unions and larger ones, while small credit unions also react more sensitively to changes in housing values and unemployment rate. Thus, they concluded, small credit unions are under pressure and incentive to grow in size in order to assure they are working profitably and guarantee their survivals as the deregulation made the distinction between financial institutions ambiguous.

Dopico (2016) concluded the four most effective ways for credit unions to grow in size, using data from 1979 to 2016. Besides going through a merger, increasing deposit benefits, attaining a higher return on asset, providing richer key financial products and making higher market expense contributed most to asset growth. A similar conclusion was drawn long time ago by Smith (1984) when he continued Smith, Cargill and Meyer's (1980) previous study and tried to develop a theoretical model explaining credit union decision making. He, as well, argued that the rates charged on loans and paid on savings deposits, the types of accounts offered, and promotional and advertising activities all influence the level of total asset size of the credit union. He also argued that the key decisions made by management team are the types of loan and savings accounts to offer, and the prices and/or quantities of those accounts, which implies that management team plays an important role

in affecting the asset size, and thus influencing the credit union's objective.

Unlike commercial banks whose goal is to maximize their profit, there is no agreement as to what the objective of credit unions should be. The most probable objectives of credit unions been argued so far are to maximize asset growth and/or membership growth, to offer more financial products, or to maximize the difference between market savings and loans rates compared with what credit unions provide (Fried et al., 1996; Goddard et al., 2002; Smith 1984; Bauer 2008). At the same time, it is argued that the objective would be different across the sizes of credit unions. Goddard, McKillop and Wilson (2008) investigated determinants of the financial performance of credit unions, using 5784 credit unions' semi-annual data from 1993-2004. They concluded that the strategies credit unions apply should differ across asset sizes. Larger credit unions should continue exploring new products according to their own expertise, while smaller ones should avoid over-diversification and focus on basic saving and loan services.

Given above, consolidation, as an activity which has direct effects on both size and management team of the credit union, should play an important role in affecting its objective, performance, credit supply as well as deposit and loan pricing behaviours.

3.2. Impacts of credit union mergers

In the sparse literature of credit union mergers, some argued that improvements are reached by target credit unions but not acquirers (Fried et al, 1999; Bauer, Miles and Nishikawa, 2009; Dopico and Wilcox, 2010). Although credit unions' behavioural objective is the subject of some debate, Fried, Lovell and Yaisawarng (1999) reasonably assumed that credit unions aim at maximizing financial services while achieving a most cost-efficient way of managing the operating expense. They used the efficiency score as a performance indicator, studying nearly 6000 credit unions with 300 merger participants during 1988-1995, and found that target credit unions have improved their service provision while acquirers have not. Bauer, Miles and Nishikawa (2009) argued that credit unions grow in size in order to realize the economies of scale, in line with Murray and White (1980), and

one alternative way for them to grow, other than internal growth, is through mergers. They studied U.S. merger activity data from 1994 to 2004, drawn from Call Report data of NCUA, examined efficiency changes and CAMEL ratio changes of both targets and acquirers. The uniqueness of their paper is that they examined whether regulators benefit from mergers, by studying CAMEL ratio, whose increase can be interpreted as gains to regulators. Improved CAMEL ratio means better financial stability; thus, regulators/public are benefitted from credit union mergers. The authors found improved CAMEL and efficiency gains to targets but little change in acquirers' efficiency, which means that there is a gain for members of target credit unions and for regulators but not for acquirers. Dopico and Wilcox (2010) argued that reducing noninterest expense is the primary objective of mergers. The authors studied credit union mergers in the U.S. from 1984 to 2009 to see how credit unions have achieved this objective. The authors found the largest impacts were achieved by mergers of equal-size credit unions while when the two credit unions were different in size, impacts were much larger for the targets.

Conversely, some found that there were no gains for both acquirers and targets after mergers, compared to non-merging credit unions on average (Garden and Ralston, 1999; Ralston, Wright and Garden, 2001). Besides studies on the U.S. credit unions, there are some researches focusing on Australian ones. These studies also used efficiency score as an indicator of performance. Based on literature in mergers of banks, where a large number of studies argued that there is potential for banks to obtain efficiency gains through merger, Garden and Ralston (1999) proposed that credit unions may have also attempted to increase efficiency through mergers. They studied 16 Australian credit unions mergers from 1993 to 1994 financial year and employed a DEA approach to examine merger effects on both allocative and x-efficiency. Different from the previous paper, this research added non-merging credit unions as a control group and compared merged credit unions' efficiencies with the control group. They ended up finding no effects of either type of efficiency relative to other credit unions on average. Ralston, Wright and Garden (2000), as an extension of their previous study, again focused on Australian credit unions from 1993 to 1998 and merger sample data from 1994 to 1995, aiming to find out whether mergers will help small

financial institutions avoid extinction. However, the efficiency gains generated from mergers were again found to be no superior to those generated through internal growth.

Worthington (2001), with focus on their efficiency changes after these mergers for Australian credit unions between 1993 to 1997, found that for the industry, on the whole, both pure technical efficiency and scale efficiency improved through mergers. Meanwhile, although Dopico and Wilcox (2010) found mergers were more beneficial to targets, they argued that over time and on average, however, mergers have been gradually shifted from only benefiting targets to the point where both targets and acquirers can obtain benefits. For example, they found that after recent mergers, instead of modestly increasing noninterest expense ratio as in the past, the ratios of acquiring credit unions dropped.

As targets have been intensely argued to be the most beneficial party in a merger, many scholars tried to figure out the characteristics of targets in the credit union mergers. Worthington (2001) argued that smaller asset size is the key determinant of being a target in a merger activity while loan portfolio diversification has a significant influence on the probability of acquisition. Goddard, McKillop and Wilson (2009), using semi-annual data from June 2001 to June 2006 of the U.S. merger wave, employed hazard functions and found that credit unions that have less room to grow or are constrained in growth opportunity are hardly attractive merger targets while credit unions with lower capitalization and narrower loan portfolios are vulnerable in mergers. These findings imply that members of the target credit union may potentially benefit from mergers as mergers help broaden the loan portfolio, thus members can enjoy richer services.

3.3. Impacts of bank mergers

Compared to the literature of credit union mergers, there are a lot more merger studies that investigate bank mergers. Carletti et al. (2001) and Prompitak (2009) summarized two major motivations of the merger in the banking industry: one is to increase market power and the other is to obtain efficiency gains. The first effect would drive up loan rates and lower down the deposit rates, thus raising up the interest margin, since banks will merge

with another one and exploit their market power to extract profits. This effect is also known as the Structure-Conduct-Performance (SCP) hypothesis. The second effect would do the opposite as the overall efficiency of the banking industry would be improved by consolidation and banks would try to pass efficiency gains to consumers. This effect is also known as the Efficient-Structure-Performance (ESP) hypothesis.

Prompitak (2009) employed both simple OLS and difference-in-difference model to study merger effect on banks' loan pricing behaviour, using European banks data. He found support for the ESP hypothesis according to the lower loan rates and narrower interest margins after a merger. Conversely, Liebersohn (2017) used difference-in-difference model to research on how competition affects bank lending behaviours and found support for the argument that competition will enhance efficiency and loan quality, which is opposite to ESP and suggests that consolidation may do harm to the efficiency.

Besides efficiency changes and interest rate changes, some studies attached their attention to credit supply changes after a merger. Studies before Berger et al. (1997) generally ignored the fact that merger activities can have an influence on operation focus since they are external dynamic events. Thus, Berger et al. (1997) were the first to decompose merger effects on small business lending into static and dynamic ones, where they gave focus on reactions of other local banks. Using data of over 6000 bank mergers, they concluded that, mergers generally reduce credit supply to small business, whereas part of the reduction was offset by other local financial institutions. Sapienza (2002) studied Italian bank data and examined the impacts of consolidation activities on the availability of credits for prior existing borrowers of the consolidated institutions, controlling the quality of the borrowers. The author concluded that the impacts of mergers depend on three factors: the reason to merge, whether it is an in-market merger or out-market one, and the market competition before the merger. He summarized three major findings. First, mergers involving banks that previously operated in the same area would benefit borrowers if these banks are with small market shares while things changed to the opposite if these banks are large ones. Second, the way mergers affect borrowers also depends on how much they relied on this

bank and how broad are other alternative financial sources. Finally, compared to banks who did not go through consolidation, small borrowers of the targets hardly can continue obtaining credits from the merged banks in the future. Haas et al. (2010) used 220 banks' data in 20 transition countries to study the loan portfolio composition determinants, which, they found, were bank ownership, size, and legislation of creditor protection. They also argued that large banks may have a relative advantage in lending to large customers as they can exploit scale economies in evaluating the hard information available on such customers. Thus, the consolidation process in transition countries may, therefore, lead to a reduced credit supply of large banks on SME financing. Similarly, Ogura and Uchida (2013), based on their empirical analysis of a Japanese small business financing dataset, found that, for small banks, soft information deteriorates after a merger, compared to those who didn't experience a merger. They concluded that bank mergers negatively affected credit supply for people who depended on small banks.

Similar to credit union literature, characteristics of banks involved in mergers were investigated. Beccalli and Frantz (2013) found that target banks tend to be riskier than acquirers. Targets are generally cost and profit inefficient, less liquid, and less capitalized, while acquirers tend to be more diversified and better managed.

3.4. Propensity score matching

It has long been argued that bank mergers can potentially improve performance (Berger and Humphrey, 1992; Shaffer, 1993), though only a few studies confirmed this improvement (Berger and Humphrey, 1997). Similarly, credit union area does not reach an agreement on merger effects, either. Given this disagreement on merger effects, Behr and Heid (2011) argued that this disagreement may partly be due to selection bias which happened when previous studies chose a wrong compare group. They used data of German bank mergers from 1995 to 2000 and employed propensity score matching strategy, avoiding selection bias, to study merger effects on bank performance. They matched every bank in a merger with a similar bank which did not experience a merger based on the propensity score, which, in their study, is the probability to merge. Instead of using standard

logit or probit model as previous research did, they used non-parametric Generalized Additive Model to calculate the probability to merge for every bank in the sample, irrespective of going through a merger or not, based on seven bank variables: return on asset, cost to income ratio, equity ratio, interest margin, non-performing loans ratio, liquid ratio and size. And then they matched banks in a merger with a non-merging bank that had the closest likelihood to merge as the merged one, and constructed a new sample consisting of only banks who went through a merger and their matching pairs. They studied the new sample and found neutral medium-term effects on profitability and cost efficiency in post-merger years, which suggested that selection bias did affect the results of previous studies.

We observed several gaps in the existing literature. Firstly, although enough attention has been attached to performance changes after a credit union consolidation, none of them have considered that selection bias might potentially affect the results. Secondly, unlike the banking field, where credit supply has drawn much emphasis, studies of credit union merger hardly investigated changes in credit supply. Existing literature offers little evidence of efficiency gains for acquiring credit unions. And merger effects on the loan portfolio and interest rates have rarely been studied. Thus, our study aims at filling up these gaps by examining merger effects on performance indicators, interest rate, credit supply and loan composition, from the perspective of acquiring credit unions.

4. Hypothesis development

Credit unions generally have three major stakeholders: management team, members/owners and regulators/public. Credit unions, as a member-owned cooperative financial institution, are in business to best serve their members. Although recent studies did not find enough evidence that acquiring credit union obtain efficiency gains through a merger, we argue that, instead of an increase in efficiency score, benefits to members should be one of the most important goals for acquirers to conduct a merger. Members can be better off through better credit unions' performance, improved interest rates, more access to credit and richer loan services. Accordingly, we developed our hypotheses as follows.

Return on asset and cost-to-income ratio are two primary indicators of performance, representing profitability and cost efficiency respectively. Members can get broader service and better interest rates as the credit union increase in profitability. Also, as argued by Dopico and Wilcox (2010), cost reduction is also one of the primary objectives of mergers. Reducing cost can also lead to higher profitability and thus benefit members. As such, we have our first hypothesis proposed as:

H1: Mergers will benefit members by improving credit union's performance, indicated by higher profitability and higher cost efficiency.

Carletti et al. (2001) summarized two major merger hypotheses. One is the structure-conduct-performance hypothesis, suggesting that financial institutions will cooperate with each other and exploit their market power to extract profits. The other one is an efficient-structure-performance hypothesis, implying that the overall efficiency of the industry would be improved by mergers. They proposed that institutions would pass the gains to consumers by lowering loan interest rates and driving up deposit interest rates. As credit unions work for the benefits of members, we argue mergers of credit unions will follow efficient-structure-performance hypothesis. That is, credit unions would pass the gains to members by providing better interest rates. Thus, if mergers benefit the members, then interest rates offered by credit unions should be improved. Accordingly, we have our

second hypothesis,

H2: Mergers will benefit members by improving deposit and loan interest rates, indicated by higher deposit interest rates and lower loan interest rates.

The original intention of a credit union is to provide members in similar financial conditions and financial capacity with unsecured credits. Thus, consumer loans, among other services, should be the most important service in credit unions (McKee and Kagan, 2015). Members would benefit from more access to credit supply. Thus, we propose that if mergers benefit members, we should observe more credit supply. Accordingly, we have our third hypothesis as,

H3: Mergers will benefit members by increasing the credit union's credit supply.

Smith (1994) argues that:

"The fundamental motivation of a credit union is to provide financial services to the membership, in particular a depository for savings and access to consumer and mortgage credit. Moreover, these offered services should be at least as attractive with respect to their price and non-price characteristics as those available from other institutions-otherwise there would be no economic rationale to organize the credit union or for members to participate. Therefore, the key decisions made by management are the types of loan and savings accounts to offer, and the prices and/or quantities of those accounts." (pp 1155)

Thus, we have our fourth hypothesis,

H4: Mergers will benefit members by expanding the choices of the loan portfolio.

5. Data and methodology

5.1. Data

The credit union data of our study are compiled from credit union financial information in ‘5300 Call Reports', which are available on the National Credit Union Administration (NCUA) website. Each credit union collects and reports accounting information and operational data quarterly to NCUA, and the data is available from 1994 Q1 to 2018 Q4. To investigate merger effects on performance indicators, interest rate, credit supply and loan composition, we collected credit union financial data and macroeconomic data from 2001 to 2016. M&A information, including merger date, surviving and target credit union names, identification numbers and locations, are made available from Credit Union National Association (CUNA). Call report data is available at a quarterly frequency from NCUA, we annualized accounting and operational data by using the year-end (December version) call reports.

As credit union loan demand and deposit supply are dependent on state-level macroeconomic indicators, such as population, unemployment rate, per capita income and asset demand for money, we collected macroeconomic data from several sources. The annual county-level unemployment rate was obtained from the Bureau of Labor Statistics for the year from 2000 to 2017. We aggregated the county-level data into state-level by summing up the total labour force data within one state and calculating the state-level unemployment rate using the sum numbers. We used the Housing Price Index to measure asset demand for money, following McKee and Kagan (2015), and the annual state-level value was available at the Federal Housing Finance Agency. We obtained the total number of business establishments from U.S. Census Bureau County Business Pattern Series, which was only accessible from 2000 to 2016, as an indicator of local economic condition. Per capita personal income and GDP growth rate were available from the U.S. Bureau of Economic Analysis, from 2000 to 2018 and from 2000 to 2017, respectively. Three-month Treasury bill interest rates were obtained from Federal Reserve Bank of St. Louis. For competition indicators, we calculated the Herfindahl-Hirschman Index using the total

deposit of each credit union for each state.

Gathering all the data mentioned above, we constructed our variables. Variables were either constructed from observed values and/or the first lag, or the observed outcome of a binary event (whether a credit union has gone through a merger and whether the merger is a cross-state one). Variable symbols, definitions and sources of data are provided in Table 5.1.

Symbol	Variable	Calculation	Source
tl_a	Total Loans	total loans/lagged total asset	call report (NCUA)
ucc	Unsecured Credit Card Loans	unsecured credit card loans/lagged total loans	
oul	Other Unsecured Loans	other unsecured loans/lagged total loans	
nvl	New Vehicle Loans	new vehicle loans/lagged total loans	
uvl	Used Vehicle Loans	used vehicle loans/lagged total loans	
fm	First Mortgages	first mortgages/lagged total loans	
orel	Other Real Estate Loans	other real estate loans/lagged total loans	
bl	Business Loans	business loans/lagged total loans	
loan_rate	Average Loan Interest Rate	Interest on Loans/lagged total loans	
depo_rate	Average Deposit Rate	dividends on shares/lagged total deposit	
roa	Return on Asset	net income/lagged total asset	
ci	Cost Income Ratio	operating expenses / gross income	
nwr	Net Worth Ratio	net worth / lagged total assets	
nim	Net Interest Margin	(total interest income-total interest expense)/lagged total asset	
npl	Non-Performing Loans	delinquent loans /lagged total loans	
ldr	Loan to Deposit Ratio	total loans /lagged total deposit	
size	Asset Size	natural logarithm of lagged total asset	
merger	Dummy of Merger	if the merger happens, it equals to 1	CUNA
cross	Dummy of Cross-state Merger	if the merger is a cross-state one, it equals to 1	CUNA

Panel A. Credit union variables

Symbol	Variable	level	Year Range	Source
unem	Unemployment Rate	county	2000-2017	Bureau of Labor Statistics
hpi	Annual Housing Price Index Value (relative to base value of yr 2000, take natural logarithm)	state	1975-2017	Federal Housing Finance Agency
est	Total Number of Establishments (natural logarithm)	state	2000-2016	U.S. Census Bureau County Business Pattern Series
pcpi	Per Capita Personal Income (natural logarithm)	state	2000-2018	U.S. Bureau of Economic Analysis
dgdp	GDP growth rate	state	2000-2017	U.S. Bureau of Economic Analysis
hhi	Herfindahl-Hirschman Index of deposits/10000	state	2001-2016	calculated from call report
rate	3-Month Treasury Bill	country	1998-2018	Federal Reserve Bank of St. Louis
crisis	dummy variable, equals to 1 if the merger happens in 2008/2009/2010			
postcrisis	dummy variable, equals to 1 if the merger happens after the end of 2010			

Panel B. State level and national level macro variables

Table 5.1 Variable definition

We classified our variables into credit union variables and regional macro variables. We used lagged value of the stock variable and used a log to scale down the large numbers of Housing Price Index value, number of establishments in each state and per capita personal income.

As we would examine the effects of mergers, post-merger data and pre-merger data would be compared. To confirm that these differences between post- and pre-merger performance indicators are not affected by other recent mergers, we limited our sample by removing acquirers who had one or more other merge activities during the 2-year and 3-year window period surrounding a merger. That is, if the merger happened at time t, we constructed two samples, where we left year t-1 to year t+1 free from other mergers and clean year t-1 to year t+2 from other mergers, respectively. This filtering process limited our merger sample to 2606 mergers for the cleaned 2-year window and 2271 mergers for the cleaned 3-year window. The filter criterion is illustrated as follows.

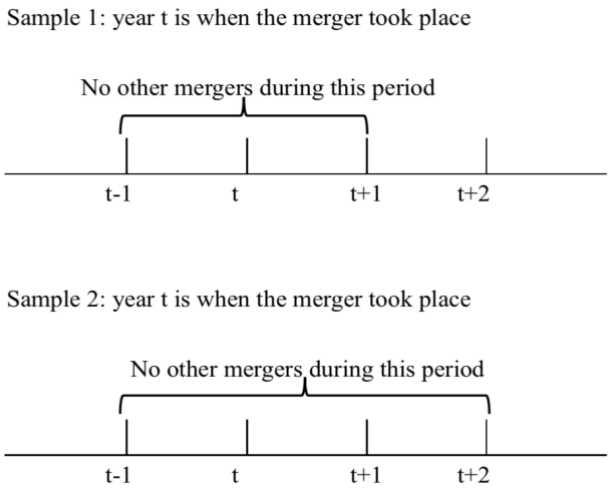

Figure 5.1 Filter criterion explanation

We then combined merger information with the credit union data and regional macroeconomic data using acquirers' credit union ID and year. We created a dummy variable called MERGER, which equals to 1 if the credit union experienced a merger at that year and otherwise equals to 0. Another dummy variable indicating whether the merger is cross-state was created, named CROSS. CROSS equals to 1 if the acquirer and the target are in different states, otherwise, it equals to 0. According to the Credit Union National Association (CUNA), the majority of the states allow to both in-state out-of-state credit unions branching. That is, credit unions can expand their services and enter into new markets by conducting a cross-state merger.

We originally plan to study on mergers happening between 2001 and 2018. However, due to the limitation in data availability of U.S. Census Bureau County Business Pattern, which only updates till 2016, we only have variables available from 2001 to 2016. Additionally, since we would compare post-merger performance and pre-merger performance, which requires us to use lag and lead data, we can only study the post-1-year change of mergers conducted between 2002 and 2015 and post-2-year change of mergers happening between 2002 and 2014.

5.2. Methodology

In order to study whether the merger benefits members, we would compare several post-merger indicators' changes between the acquirers and credit unions who did not go through a merger. The indicators' changes were calculated by subtracting the value of each indicator during the pre-merger period from that during the post-merger period. Post-merger periods we used were t+1 and t+2, with time t defined as the year when the merger transaction took place. Since the accounting data we used were all year-end data, we used t-1 as the pre-merger period to ensure we did not miscalculate the effect. Thus, instead of comparing post-merger indicators at t+1 and t+2 with those at time t, we used variables at time t-1 as pre-merger indicators.

Since the acquirers are generally larger and more profitable than average non-merging credit unions, instead of simply comparing them directly, we matched every acquirer with a similar credit union according to several criteria to avoid selection bias. We followed Behr and Heid (2011) in using Propensity Score Matching process to find a matching pair for each acquirer. First introduced by Rosenbaum and Rubin (1983), the propensity score matching method allows us to pair up treated credit unions with similar credit unions except the ‘treatment'. The treatment here means that the credit union has experienced a merger. This process mitigated the potential possibility of selection bias risen from the differences in the eight dimension we chose. We completed the PSM process as follows.

‘Treatment' here refers to the merger activity, thus we divided our sample into two groups. One is the treated group, whose dummy variable MERGER equals to 1, and the other group is a control group, whose dummy variable MERGER equals to 0. Firstly, we estimated the probability of every credit union in our sample to be involved in a merger event using a propensity score model. This model is a logit regression model where the dummy variable MERGER is the dependent variable. The independent variables we used were similar to those used by Behr and Heid (2011) in the study on commercial banks. To make the variables more suitable for our credit union sample, we made some adjustments. Moreover, we added HHI as one additional criterion to represent the market concentration of each

state. Thus, together we have eight indicators to serve as independent variables in the propensity score model. We used return on asset (ROA) as a measure for a credit union's profitability and cost-to-income ratio (CI) to measure cost (in) efficiency. Net worth ratio (NWR) was used to control the credit union's financial strength, and net interest margin (NIM) was used to represent its ability to manage the spread. We used the non-performing loans ratio (NPL) and loan to deposit ratio (LDR) to control credit risk and liquidity risk of the credit union respectively. We used asset size to control for the size while HHI was used to control for concentration. Using these independent variables, we computed the propensity score, which estimates the likelihood of being involved in a merger given those indicators, for every credit union. Secondly, we matched every acquirer credit union to one non-merging counterpart with the closest propensity score within the merger transaction year. Thirdly, we put the matched pairs into one dataset.

As such, we finished constructing our data set which includes the ‘treated' (actual acquirers) and ‘matched' control group. We used a dummy variable ‘MERGER' to distinguish them. With the closest propensity score, this process allowed us to assume that the matched group can represent the acquirers' characters as if the acquirers didn't go through a merger event. Then we can calculate indicator changes by subtracting pre-merger value from post-merger value for both merging credit unions and matched non-merging credit unions.

To examine our hypothesis 1, we need to calculate changes in performance indicators: profitability indicator ROA and cost (in) efficiency indicator CI. We constructed our dependent variables droa_1 (droa_2) and dci_1 (dci_2) by subtracting the ROA and CI at time t-1 from their values at time t+1 (t+2). To test our hypothesis 2, dependent variables should be changes in average loan and deposit interest rates from the pre-merger period to post-merger period. Thus, dloan_rate_1 (dloan_rate_2) and ddepo_rate_1 (ddepo_rate_2) were constructed by subtracting loan interest rate and deposit interest rate at time t-1 from those at time t+1 (t+2), respectively. We also created dependent variable dtl_1 (dtl_2) as the difference between total loan ratio at time t-1 and that at time t+1 (t+2) to examine hypothesis 3. Finally, the difference between each loan proportion at time t-1 and t+1 (t+2)

was calculated to be the dependent variables of the regressions to test hypothesis 4. Therefore, we run a set of regressions and the model is presented as follows:

$$dX\_1(dX\_2) = \alpha + \beta_1 * merger + \beta_2 * cross + \beta_3 * roa + \beta_4 * ci + \beta_5 * size + \beta_6 * nim + \beta_7 * nwr + \beta_8 * npl + \beta_9 * ldr + macro_{controls} + crisis_{controls} + \varepsilon \quad (5.1)$$

Where: dX is the change in each indicator between pre-merger year t-1 and post-merger year t+1 (t+2)[2]; merger is a dummy variable that takes 1 if the credit union is an acquirer in year t and 0 otherwise; cross is a dummy variable that takes 1 if the merger involved two credit unions from different states and 0 otherwise; ROA, CI, SIZE, NIM, NWR, NPL, LDR and macro variables were all measured at time t-1; crisis controls are dummy variable crisis, which takes 1 if the merger happened during the financial crisis and equals to 0 otherwise, and dummy variable postcrisis, which takes value 1 if the merger took place after the crisis and equals to 0 otherwise.

We compared the changes in each indicator of merging credit unions with the changes of matched non-merging credit unions. Merger effect is defined as the difference of these changes between merging and non-merging credit unions. We calculated merger effect by subtracting the change in each indicator of the matched credit union from the change in each indicator of the real acquirers, using formula as follows:

$$dd\_X\_1 = dX_{merger}\_1 - dX_{match}\_1 \quad (5.2)$$

$$dd\_X\_2 = dX_{merger}\_2 - dX_{match}\_2 \quad (5.3)$$

Where X stands for all dependent variables mentioned above. [3]

[2] As we create two samples, where one is cleaned from other recent mergers during t-1 to t+1 and the other is cleaned from other recent mergers during t-1 to t+2, dX_1 is calculated using the first sample while dX_2 is calculated from the second sample.

[3] Similarly, we calculate dd_X_1 using the first sample, which is cleaned from other mergers from t-1 to t+1, and we calculate dd_X_2 using the second sample, which is free from other mergers from t-1 to t+2.

6. Results

6.1. Key statistics of the sample

Table 6.1 presents key statistics of our sample after winsorization at 1% for both tails. For comparison, we separated the key statistics into three parts: one is for the acquirers 1 year prior to the merger, one is for acquirers 1 year after the merger and the remaining is for non-merging credit unions. Here, we compare acquirers with all the non-merging credit unions.

Panel A: merger sample											
	Key statistics of the acquirer 1 yr before merger					Key statistics of the acquirer 1 yr after merger					T-test with acquirers pre-1-yr
Variable	N	MIN	MAX	MEAN	STD	N	MIN	MAX	MEAN	STD	
tl_a	2309	0.170827	1.118915	0.672343	0.167319	2309	0.163632	1.063474	0.648951	0.168057	-11.1979
ucc	2309	0	0.20046	0.054984	0.043265	2309	0	0.197016	0.053009	0.041666	-5.8085
oul	2309	0	0.891511	0.078363	0.078309	2309	0	0.803227	0.077845	0.075039	-0.6318
nvl	2309	0	0.656108	0.167214	0.108878	2309	0	0.661324	0.156806	0.105083	-8.4722
uvl	2309	0	0.818652	0.269189	0.136316	2309	0	0.820597	0.269015	0.135177	-0.1193
fm	2309	0	0.818218	0.271177	0.1928	2309	0	0.806344	0.279078	0.189054	5.0853
orel	2309	0	0.5497191	0.154519	0.115374	2309	0	0.563563	0.146016	0.111122	-8.051
bl	2309	0	0.3079804	0.026786	0.049737	2309	0	0.30755	0.033423	0.055377	12.0129
roa	2309	-0.03487	0.028971	0.006417	0.006353	2309	-0.03501	0.027699	0.004641	0.007188	-11.6467
ci	2309	0.244702	1.4508	0.64275	0.13502	2309	0.237101	1.390686	0.683511	0.13979	22.3219
nwr	2309	0.060968	0.319317	0.118062	0.03558	2309	0.058886	0.332507	0.117265	0.034184	-2.2326
nim	2309	0.014055	0.0768986	0.038655	0.009232	2309	0.014561	0.07375	0.036493	0.008437	-18.7061
npl	2309	0	0.172706	0.013166	0.013377	2309	0	0.143452	0.01383	0.012695	2.5115
ldr	2309	0.208083	1.152027	0.721758	0.168779	2309	0.195845	1.145883	0.717174	0.1769	-2.219
size	2309	13.2262	21.20522	18.24996	1.414283	2309	13.34534	21.23562	18.43552	1.401628	38.1863
loan_rate	2309	0.039392	0.131645	0.070157	0.013107	2309	0.033718	0.14297	0.065843	0.012688	-25.3681
depo_rate	2309	0	0.04561	0.014289	0.009886	2309	0	0.042013	0.011321	0.008939	-19.0053

Panel B: Non-merger sample					
	Key statistics of Non-merger CUs				
Variable	N	MIN	MAX	MEAN	STD
tl_a	104324	0.095934	1.125508	0.589617	0.190352
ucc	104324	0	0.202086	0.036294	0.044546
oul	104324	0	1.042444	0.134599	0.150913
nvl	104324	0	0.668189	0.206244	0.13794
uvl	104324	0	0.822532	0.290871	0.157926
fm	104324	0	0.82231	0.168231	0.201709
orel	104324	0	0.565316	0.100387	0.119978
bl	104324	0	0.319454	0.014203	0.04024
roa	104324	-0.03751	0.029238	0.004218	0.008025
ci	104324	0.232261	1.494058	0.680424	0.184079
nwr	104324	0.058686	0.378746	0.134172	0.052278
nim	104324	0.011274	0.080344	0.037919	0.010703
npl	104324	0	0.200451	0.017852	0.022661
ldr	104324	0.116649	1.154155	0.657566	0.199465
size	104324	11.84098	21.23824	16.65662	1.767972
loan_rate	104324	0.033279	0.147967	0.071701	0.016028
depo_rate	104324	0	0.04767	0.013519	0.010064

Table 6.1 Key statistics of the sample[4]

[4] Note: tl_a is total loans, ucc is unsecured credit card loans, oul is other unsecured loans, nvl is new vehicle loans, uvl is used vehicle loans, fm is first mortgages, orel is other real estate loans, bl is business loans, roa is return on asset; ci is cost-income ratio, nwr is net worth ratio, nim is net interest margin, npl is non-performing loan ratio, ldr is loan-to-deposit ratio, size is natural logarithm of total asset, loan_rate is average loan rate, and depo_rate is average deposit rate.

We first simply compared the indicators of acquirers 1 year before the merger event with 1 year after the merger. As seen in Table 2, there were many significant changes from pre-merger time to post-merger periods. Average total loan to asset ratio decreased, meaning shrinking credit supply (seen from t-value of -11.20). There were numerically small but significant changes in the loan portfolios by simple comparison, where decrease in unsecured credit card loans (t-value of -5.81), decrease in new vehicle loans (with t-value of -8.47), increase in first mortgage (t-value of 5.08), decrease in other real estate loans (with t-value of -8.05) and increase in business loan (with t-value of 12.01) were observed. The profitability decreased (seen from t-value of -11.65) while cost-to-income ratio increased (with t-value of 22.32). The net worth ratio dropped (t-value of -2.23), net interest margin dropped (with t-value of -18.71). We also observed an increase in credit risk (with t-value of 2.51) but a decrease in liquidity risk (t-value of -2.22). Besides the larger size (with t-value of 38.19), we also observed decreasing loan interest rate (t-value of -25.37) and deposit interest rate (with t-value of -19.01). To conclude, by a simple comparison between statistics before and after the merger event, other than a decrease in the loan interest rate and increase in the offering of the first mortgage and business loan, we did not find any benefits to the members of the acquirers.

We then compared the indicators of acquirers with those of all the credit unions who didn't experience mergers. Acquirers were much larger in asset size, more profitable and more cost-efficient than their non-merging peers. In addition, the acquirers charged lower loan interest rates than the non-merging group. Furthermore, due to the size difference between the acquirers and non-merging counterparts, their loan portfolio differed a lot, where acquirers put more emphasis on first mortgages while credit unions which did not acquire focused more on vehicle loans. That is to say, when we studied the impacts of merger events, we cannot simply look at the differences between credit unions who conducted a merger and all those who did not. To address this problem, we employed PSM to find a matching pair for each acquirer.

6.2. Assessment of propensity score matching quality

Table 6.2 reports the results of pairwise t-tests, which we used to assess the quality of the matching process. We matched each acquirer with a similar non-merging credit union based on eight indicators: return on asset, cost-to-income ratio, net-worth ratio, net interest margin, non-performing loan ratio, loan-to-deposit ratio, size and HHI. We conducted the matching process at time t-1 instead of time t to avoid any influence on the financial reports due to the mergers. We calculated the treated mean, which is the mean of acquirer credit union indicators, and matched mean, which is the mean of matching group's indicators. A T-test was applied to test whether the differences of the means are different from zero.

acquirer	clean from pre 1yr to post 1yr				clean from pre 1yr to post 2yr			
	N	Treated Mean	Matched mean	T stat of difference	N	Treated Mean	Matched mean	T stat of difference
roa	2606	0.00635	0.00633	-0.11	2271	0.00614	0.00627	0.66
ci	2606	0.652	0.6517	-0.08	2271	0.6566	0.6544	-0.51
nwr	2606	0.1177	0.1171	-0.61	2271	0.1186	0.1162	-2.2**
nim	2606	0.0382	0.0384	0.93	2271	0.0382	0.0383	0.49
npl	2606	0.0134	0.0135	0.17	2271	0.0136	0.0135	-0.26
ldr	2606	0.7233	0.7252	0.4	2271	0.7188	0.7178	-0.19
size	2606	18.3054	18.3099	0.11	2271	18.2106	18.212	0.03
hhi	2606	405.6	407.2	0.16	2271	413.1	420.2	0.67
loan_rate	2606	0.0688	0.0686	-0.74	2271	0.0689	0.0687	-0.33
depo_rate	2606	0.0134	0.0132	-1	2271	0.0133	0.0133	-0.08
tl_a	2606	0.6712	0.6698	-0.48	2271	0.6664	0.6653	-0.2
ucc	2606	0.0547	0.0524	-1.91*	2271	0.0537	0.0534	-0.24
oul	2606	0.0775	0.0781	0.29	2271	0.0791	0.0793	0.08
nvl	2606	0.1628	0.1718	2.85***	2271	0.1644	0.1706	1.81*
uvl	2606	0.268	0.2633	-1.24	2271	0.271	0.2614	-2.31**
fm	2606	0.28	0.2731	-1.24	2271	0.2743	0.2763	0.33
orel	2606	0.1519	0.145	-2.10**	2271	0.1485	0.1416	-2.01**
bl	2606	0.0304	0.0308	0.31	2271	0.0284	0.031	1.62

Table 6.2 Assess the matching quality: compare main variables at t-1[5]

[5] Note: tl_a is total loans, ucc is unsecured credit card loans, oul is other unsecured loans, nvl is new vehicle loans, uvl is used vehicle loans, fm is first mortgages, orel is other real estate loans, bl is business loans, roa is return on asset; ci is cost-income ratio, nwr is net worth ratio, nim is net interest margin, npl is non-performing loan ratio, ldr is loan-to-deposit

We report the results for both samples: one is cleaned from other mergers during t-1 to t+1 and the other is free from the influence of other mergers during t-1 to t+2. Although there was one significant difference in the net worth ratio in the second sample, the numbers were very close, by comparing the number itself. We also compared other important variables between acquirers and matching peers. They have some differences in loan composition. However, these variables are not part of the matching criteria. In general, we can say that our matching procedure produced a good match, and it suggested that the acquirer credit unions and their matching pairs shared similar characteristics 1 year before the merger. That is, the matching group should have similar characters as the treated acquirers after the merger, except the influence brought by mergers.

Table 6.3 reports pairwise correlation coefficients of the regression variables. Panel A provides pairwise correlation coefficients of credit union variables while Panel B reports the correlation coefficients of regional macroeconomic variables.

	merger	cross	roa	ci	size	nim	nwr	npl	ldr
merger	1								
cross	-0.156***	1							
roa	-0.001	0.0087	1						
ci	0.0035	-0.0078	-0.52***	1					
size	-0.023	0.066***	0.16***	-0.25***	1				
nim	-0.0088	-0.013	0.21***	-0.009	-0.38***	1			
nwr	0.016	-0.024	0.062***	-0.047***	-0.33***	0.04**	1		
npl	-0.0075	0.016	-0.22***	0.080***	-0.29***	0.18***	0.010***	1	
ldr	-0.0047	-0.0028	0.17***	-0.2***	0.17***	0.38***	-0.13***	-0.05***	1

Panel A. Credit union variables

ratio, size is natural logarithm of total asset, loan_rate is average loan rate, hhi is Herfindahl-Hirschman Index of deposits in each state, and depo_rate is average deposit rate.

PSM criteria: return on asset, cost-income ratio, net worth ratio, net interest margin, non-performing loan ratio, loan-to-deposit ratio, asset size and Herfindahl-Hirschman Index of deposits.

*** p<0.01, ** p<0.05, * p<0.1

	dgdp	hpi	unem	pcpi	est	hhi	rate	crisis	postcrisis
dgdp	1								
hpi	0.09***	1							
unem	-0.34***	-0.25***	1						
pcpi	-0.07***	0.5***	0.09***	1					
est	0.004	0.09***	0.2***	0.15***	1				
hhi	0.03	0.07***	-0.19***	-0.05***	-0.7***	1			
rate	0.25***	0.17***	-0.55***	-0.35***	0.04**	-0.015	1		
crisis	-0.36***	0.27***	0.01	0.07***	0.039**	-0.02	0.18***	1	
postcrisis	-0.046***	-0.01	0.4***	0.58***	-0.04**	0.03*	-0.69***	-0.38***	1

Panel B. Macro-variables

Table 6.3 Correlation table of independent variables[6]

As seen from Panel A, return on asset and cost-to-income were strongly correlated, however, it is very reasonable as the more efficient a credit union is, the more profitably it operates. Panel B shows the correlations of economic regional variables, where credit union HHI was highly correlated with the number of establishments in the state. We will not include them in the same model, to avoid potential multi-collinearity. Besides HHI and number of establishments, there were other pairs which seem to be highly correlated. However, due to the fact that we used those macro variables just to control for state effect and year effect, they will not affect our main results.

6.3. Regression results

Regression analysis is used to examine our hypotheses. To test our hypothesis 1, we run

[6] Note: Independent variables are all measured in one year prior to the merger (t-1). Merger is a dummy variable that equals to 1 if credit union experienced a merger in that year and cross is a dummy variable that equals to 1 if the merger is a cross-state one. Roa is return on asset; ci is cost-income ratio, nwr is net worth ratio, nim is net interest margin, npl is non-performing loan ratio, ldr is loan-to-deposit ratio, size is natural logarithm of total asset,dgdp is GDP growth rate, hpi is housing price index, unem is unemployment rate, pcpi is per capita personal income, hhi is Herfindahl-Hirschman Index of deposits in each state, rate is interest rate, crisis is a dummy variable which is 1 for 2008-2010, postcrisis is a dummy variable which is 1 after 2010, and est is number of establishments in the state. *** p<0.01, ** p<0.05, * p<0.1

regression on change of return on asset and on change of cost-to-income ratio. Results are shown in Table 6.4. As shown in this table, the coefficient of the merger dummy is negatively significant in regression of the change in return on asset 1 year after the merger (droa_1).

VARIABLES	droa_1	droa_1	droa_2	droa_2	dci_1	dci_1	dci_2	dci_2
merger	-0.00048**	-0.00048**	-0.00013	-0.00012	0.00251	0.00249	-0.00022	-0.00034
	[-2.34]	[-2.34]	[-0.52]	[-0.48]	[1.06]	[1.05]	[-0.07]	[-0.11]
cross	0.00023	0.00023	0.00036	0.00034	0.01237	0.01316*	0.02135**	0.02169**
	[0.34]	[0.35]	[0.46]	[0.43]	[1.61]	[1.71]	[2.12]	[2.15]
ci	0.00904***	0.00904***	0.01197***	0.01199***				
	[9.62]	[9.62]	[10.56]	[10.58]				
size	0.00020**	0.00020**	0.00013	0.00014	-0.00294***	-0.00307***	-0.00378***	-0.00388***
	[2.13]	[2.15]	[1.15]	[1.22]	[-2.72]	[-2.83]	[-2.62]	[-2.68]
nim	-0.14282***	-0.14233***	-0.17796***	-0.17610***	0.70832***	0.68750***	0.70129***	0.68116***
	[-10.08]	[-10.02]	[-10.41]	[-10.29]	[4.17]	[4.03]	[3.14]	[3.04]
nwr	-0.01415***	-0.01418***	-0.01726***	-0.01717***	0.03962	0.03919	0.12042**	0.11917**
	[-4.66]	[-4.67]	[-4.62]	[-4.60]	[1.12]	[1.11]	[2.52]	[2.49]
npl	0.04546***	0.04546***	0.06097***	0.06085***	0.32905***	0.33127***	0.53263***	0.53521***
	[5.69]	[5.69]	[6.05]	[6.04]	[3.50]	[3.52]	[4.08]	[4.10]
ldr	0.00090	0.00089	0.00073	0.00064	-0.07166***	-0.07046***	-0.06822***	-0.06714***
	[1.27]	[1.26]	[0.84]	[0.74]	[-8.79]	[-8.63]	[-6.24]	[-6.12]
dgdp	-0.00015***	-0.00015***	-0.00009*	-0.00008	-0.00139***	-0.00145***	-0.00469***	-0.00476***
	[-3.49]	[-3.45]	[-1.75]	[-1.62]	[-2.74]	[-2.85]	[-7.35]	[-7.43]
hpi	-0.00194**	-0.00186**	-0.00443***	-0.00436***	-0.03268***	-0.03164***	0.00532	0.00522
	[-2.41]	[-2.32]	[-4.45]	[-4.42]	[-3.50]	[-3.41]	[0.42]	[0.42]
unem	0.00034***	0.00035***	0.00030***	0.00034***	0.00034	-0.00021	0.00259**	0.00213
	[4.45]	[4.31]	[3.08]	[3.34]	[0.38]	[-0.23]	[2.04]	[1.63]
pcpi	-0.00025	-0.00025	0.00039	0.00071	-0.01783*	-0.02295**	-0.00947	-0.01348
	[-0.27]	[-0.26]	[0.35]	[0.62]	[-1.66]	[-2.10]	[-0.66]	[-0.92]
hhi	0.00290		0.00410		0.02713		-0.02780	
	[0.92]		[1.13]		[0.75]		[-0.60]	
rate	-0.00082***	-0.00082***	-0.00097***	-0.00096***	0.00783***	0.00757***	0.02526***	0.02506***
	[-8.57]	[-8.56]	[-8.45]	[-8.30]	[7.08]	[6.83]	[17.31]	[17.12]
crisis	-0.00179***	-0.00180***	0.00211***	0.00206***	0.09591***	0.09673***	0.09373***	0.09438***
	[-5.29]	[-5.28]	[5.37]	[5.22]	[24.40]	[24.44]	[18.60]	[18.65]
postcrisis	-0.00338***	-0.00339***	-0.00212***	-0.00226***	0.05220***	0.05427***	0.07874***	0.08051***
	[-7.98]	[-7.85]	[-4.09]	[-4.29]	[10.97]	[11.17]	[12.22]	[12.26]
est		-0.00009		-0.00028*		0.00175		0.00284
		[-0.70]		[-1.79]		[1.15]		[1.44]
roa					2.33512***	2.34574***	3.01248***	3.02153***
					[11.35]	[11.39]	[10.83]	[10.87]
Constant	0.00836	0.00907	0.01318	0.01267	0.39068***	0.42504***	0.09388	0.10565
	[0.99]	[1.09]	[1.32]	[1.28]	[4.02]	[4.42]	[0.74]	[0.84]
Observations	4,507	4,507	3,545	3,545	4,507	4,507	3,545	3,545
R-squared	0.128	0.128	0.192	0.192	0.186	0.186	0.231	0.231
Adjusted R-squared	0.125	0.125	0.188	0.189	0.183	0.183	0.227	0.227
Ftest	41.14	41.12	52.34	52.49	63.95	64.01	66.08	66.22
Prob>F	0	0	0	0	0	0	0	0

Table 6.4 Regression analysis of changes in performance[7]

[7] The sample includes all the mergers and their matching pairs. droa_1 (dci_1)/droa_2 (dci_2) represents for the change in roa (ci) of a credit union between t-1 and t+1/t-1 and t+2. Independent variables are all measured in one year prior to the merger (t-1). Merger is a dummy variable that equals to 1 if credit union experienced a merger in that year and cross is a dummy variable that equals to 1 if the merger is a cross-state one. Roa is return on asset; ci is cost-income ratio, nwr is net worth ratio, nim is net interest margin, npl is non-performing loan ratio, ldr is loan-to-deposit ratio, size is natural

As 'merger' is a dummy variable which takes 1 if the credit union experienced a merger, the coefficient represents the difference in change of the profitability, compared to that of non-merging credit unions. The negative significant coefficient illustrates that a merged entity was on average less profitable one year following merger compared to their matched peers. However, two years after the merger the difference in profitability became insignificant. Although we did not find merger itself to have any influence on the change of cost efficiency (dci_1, dci_2), no matter one year or two years after the merger, cross-state merger dummy (cross) is positive and significant at 5% two years following the merger. This result implies that when CUs were involved in mergers across the state line, we can see deterioration in cost efficiency. The cost of credit unions mainly came from the regulatory burden, non-regulatory compliance and cost of deposits. This deterioration in cost efficiency may be attributed to the difficulty in entering a new market, as such leading to higher cost of deposits, higher regulatory burden and/or non-regulatory compliance associated with such geographical expansion[8].

Previous studies on commercial bank mergers found evidence of improved operating performance for the merged banks (Cornett and Tehranian, 1992; DeLong and DeYoung, 2007) using different proxies for operating performance, however, they did not include adjustments to control for selection bias. Behr and Heid (2011) also examined merger effects on commercial banks, and they compared the effects between ‘naive' comparison (compare the merged entities with the average non-merging group) and the comparison using propensity score matching sample. Contrast to previous studies, they found a

logarithm of total asset,dgdp is GDP growth rate, hpi is housing price index, unem is unemployment rate, pcpi is per capita personal income, hhi is Herfindahl-Hirschman Index of deposits in each state, rate is interest rate, crisis is a dummy variable which is 1 for 2008-2010, postcrisis is a dummy variable which is 1 after 2010, and est is number of establishments in the state. T-statistics in brackets. *** p<0.01, ** p<0.05, * p<0.1

8 We further examined whether there was an impact on cost efficiency and profitability three and five years after the merger. These results are presented in Table A.5 in the Appendix. We did not observe any impacts on these performance ratios. However, when the merger was a cross-state one, we see deterioration in cost efficiency.

decrease in profitability in propensity score matching sample, but the decrease was less than that what they found in ‘naive' comparison. Also, they did not find any immediate effects on cost efficiency in the propensity score matching sample, but the ‘naive' comparison found a reduction in efficiency. Our results, which employed propensity score matching to compare acquirers with their matching peer and controlled pre-merger indicators and macroeconomic variables, were in line with what Behr and Heid (2011) have found using the propensity score matching but different from their ‘naive' comparison.

The improvements on return on asset were positively related to pre-merger cost inefficiency. This may imply that an increase in profitability can be obtained more if the credit union has more room to improve cost efficiency. Profitability gains were also positively related to pre-merger size (size) and credit risk (NPL), while gains were negatively related with net interest margin (NIM) and net worth ratio (NWR). In contrary, improvements of cost efficiency were negatively related with profitability (ROA), net interest margin (NIM) and credit risk (NPL), but positively related with size and liquidity risk (LDR), although some effects did not show up in the first year.

To examine our hypothesis 2, we applied regression analysis on average loan interest rates and average deposit rates (dloan_rate_1, dloan_rate_2, ddepo_rate_1 and ddepo_rate_2). We report the results in table 6.5. The insignificant coefficient of dummy variable MERGER indicates that compared to non-merging credit unions, merger on average had no impact on loan or deposit rates. The results supported neither SCP hypothesis nor ESP hypothesis proposed in banking mergers. However, we found negative and significant coefficients of cross-state merger indicator (cross) for change in deposit rates. When credit unions were involved in mergers across the state line, the members experienced a lower deposit rate compared to peer credit unions. This may reflect the fact that mergers cross the state line involved additional regulatory costs and CUs transferred the costs to the depositors. We related this result to our findings in Table 6.4, where we argued that the decrease in cost efficiency may be attributed to an increase in the cost of deposits and/or higher regulatory burden. Since we did not observe higher deposit interest rates, the

deterioration in cost efficiency should mainly come from additional regulatory burden brought by cross-state mergers[9].

VARIABLES	dloan_rate_1	dloan_rate_1	dloan_rate_2	dloan_rate_2	ddepo_rate_1	ddepo_rate_1	ddepo_rate_2	ddepo_rate_2
merger	0.00001	0.00002	0.00040	0.00042	-0.00023	-0.00023	-0.00001	-0.00001
	[0.06]	[0.07]	[1.41]	[1.46]	[-1.30]	[-1.29]	[-0.05]	[-0.04]
cross	-0.00080	-0.00092	-0.00055	-0.00059	-0.00220***	-0.00227***	-0.00223***	-0.00225***
	[-1.11]	[-1.27]	[-0.61]	[-0.65]	[-3.83]	[-3.97]	[-2.97]	[-2.99]
roa	0.07808***	0.07492***	0.06495**	0.06369**	0.23303***	0.23082***	0.28276***	0.28196***
	[3.39]	[3.25]	[2.19]	[2.15]	[12.71]	[12.60]	[11.53]	[11.50]
ci	0.01708***	0.01704***	0.02051***	0.02049***	0.02424***	0.02421***	0.02927***	0.02924***
	[14.03]	[14.03]	[13.30]	[13.30]	[25.05]	[25.06]	[22.97]	[22.96]
size	-0.00032***	-0.00029***	-0.00037***	-0.00036***	0.00022***	0.00024***	0.00039***	0.00039***
	[-3.07]	[-2.78]	[-2.81]	[-2.73]	[2.71]	[2.95]	[3.57]	[3.58]
nim	-0.29521***	-0.28909***	-0.40112***	-0.39868***	-0.22727***	-0.22298***	-0.26942***	-0.26903***
	[-17.57]	[-17.18]	[-18.85]	[-18.70]	[-17.02]	[-16.67]	[-15.32]	[-15.27]
nwr	0.02044***	0.02042***	0.01697***	0.01711***	0.00750***	0.00747***	0.01187***	0.01192***
	[6.14]	[6.15]	[3.93]	[3.97]	[2.83]	[2.83]	[3.33]	[3.34]
npl	0.01475	0.01424	-0.01489	-0.01521	0.03675***	0.03640***	0.02417**	0.02399**
	[1.63]	[1.58]	[-1.24]	[-1.27]	[5.12]	[5.08]	[2.44]	[2.42]
ldr	0.00502***	0.00479***	0.00817***	0.00805***	0.00895***	0.00880***	0.00954***	0.00951***
	[6.51]	[6.20]	[8.22]	[8.08]	[14.59]	[14.33]	[11.62]	[11.54]
dgdp	0.00037***	0.00038***	0.00052***	0.00052***	0.00048***	0.00049***	0.00059***	0.00059***
	[7.76]	[8.07]	[8.94]	[9.05]	[12.80]	[13.06]	[12.44]	[12.43]
hpi	0.00452***	0.00472***	0.00597***	0.00599***	0.00614***	0.00632***	0.00375***	0.00368***
	[5.15]	[5.43]	[5.22]	[5.28]	[8.80]	[9.14]	[3.96]	[3.93]
unem	0.00065***	0.00076***	0.00068***	0.00073***	0.00056***	0.00063***	0.00036***	0.00038***
	[7.72]	[8.66]	[5.96]	[6.20]	[8.37]	[9.09]	[3.82]	[3.86]
pcpi	0.00133	0.00223**	0.00004	0.00049	0.00089	0.00148*	0.00071	0.00087
	[1.31]	[2.16]	[0.03]	[0.37]	[1.10]	[1.80]	[0.66]	[0.80]
hhi	0.00800**		0.00344		0.00681**		-0.00127	
	[2.35]		[0.82]		[2.51]		[-0.37]	
rate	0.00106***	0.00110***	0.00019	0.00021	0.00011	0.00014*	-0.00187***	-0.00186***
	[10.14]	[10.52]	[1.42]	[1.58]	[1.38]	[1.69]	[-17.06]	[-16.92]
crisis	-0.00263***	-0.00282***	-0.00513***	-0.00521***	-0.00864***	-0.00877***	-0.01247***	-0.01250***
	[-7.14]	[-7.61]	[-11.28]	[-11.39]	[-29.44]	[-29.72]	[-33.17]	[-33.08]
postcrisis	-0.00339***	-0.00379***	-0.00783***	-0.00802***	-0.00610***	-0.00636***	-0.01208***	-0.01215***
	[-7.29]	[-8.02]	[-13.02]	[-13.11]	[-16.47]	[-16.90]	[-24.33]	[-24.02]
est		-0.00070***		-0.00033*		-0.00051***		-0.00005
		[-4.92]		[-1.84]		[-4.47]		[-0.32]
Constant	-0.04664***	-0.04943***	-0.03796***	-0.03920***	-0.06413***	-0.06554***	-0.05005***	-0.05105***
	[-5.11]	[-5.48]	[-3.31]	[-3.44]	[-8.84]	[-9.14]	[-5.28]	[-5.41]
Observations	4,507	4,507	3,545	3,545	4,507	4,507	3,545	3,545
R-squared	0.181	0.185	0.218	0.219	0.375	0.377	0.458	0.458
Adjusted R-squared	0.178	0.182	0.214	0.215	0.373	0.375	0.455	0.455
Ftest	58.44	59.78	57.87	58.07	158.6	159.9	175.3	175.3
Prob>F	0	0	0	0	0	0	0	0

Table 6.5 Regression analysis of changes in loan/deposit interest rates[10]

[9] As reported in Table A.6, we did not find any impact from the merger on change in loan interest rate up to five years after the merger, but we observed a deterioration in deposit rates five years after the merger. Additionally, for the cross-state merger, we detected a deterioration in the deposit rate after three years and five years after the merger. Taken together, we saw deterioration in deposit rate persists for the cross-state merger from one year to five years after the merger.

[10] The sample includes all the mergers and their matching pairs. dloan_rate_1 (ddepo_rate_1)/dloan_rate_2 (ddepo_rate_2) represents for the change in average loan (deposit) interest rate of a credit union between t-1 and t+1/t-1 and t+2. Independent variables are all measured in one year prior to the merger (t-1). Merger is a dummy variable that equals to 1 if credit union experienced a merger in that year and cross is a dummy variable that equals to 1 if the merger is a cross-state one. Roa is return on asset; ci is cost-income ratio, nwr is net worth ratio, nim is net interest margin, npl

Furthermore, the results in Table 6.5 also showed that increase on loan interest rates was positively related with profitability (ROA), financial strength (NWR) and liquidity risk (LDR), but negatively related with cost efficiency (CI), size and net interest margin (NIM). Contrarily, the larger increase on deposit rates were obtained with higher profitability (ROA), lower cost-efficiency (CI), larger size, smaller net interest margin (NIM), higher financial strength (NWR), higher credit risk (NPL) and higher liquidity risk (LDR).

As for our hypothesis 3, regression analysis was employed to study the change in total credit supply (dtl_1 and dtl_2). Results are presented in Table 6.6. The merger dummy (merger) is negatively significant, meaning that merger activity reduced the acquirers' credit supply more, in comparison to matched similar credit unions who didn't experience a merger. This effect was not transitory: we found that this effect persists up to two years after the merger[11].

is non-performing loan ratio, ldr is loan-to-deposit ratio, size is natural logarithm of total asset,dgdp is GDP growth rate, hpi is housing price index, unem is unemployment rate, pcpi is per capita personal income, hhi is Herfindahl-Hirschman Index of deposits in each state, rate is interest rate, crisis is a dummy variable which is 1 for 2008-2010, postcrisis is a dummy variable which is 1 after 2010, and est is number of establishments in the state. T-statistics in brackets. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

[11] As reported in Table A.7, this impact seemed to not to persist after the second year. We did not detect a reduction in credit supply when compared with the non-merger peers either three or five years after the merger. Interestingly, three years after the merger, for cross-state acquirers we found an increase in their credit supply, which however did not persist five years after these mergers.

VARIABLES	dtl_1	dtl_1	dtl_2	dtl_2
merger	-0.00959***	-0.00958***	-0.00786**	-0.00789**
	[-3.53]	[-3.53]	[-2.21]	[-2.22]
cross	0.00124	0.00153	0.01250	0.01263
	[0.14]	[0.17]	[1.10]	[1.11]
roa	1.40577***	1.40216***	1.29862***	1.30374***
	[4.99]	[4.98]	[3.52]	[3.53]
ci	0.17799***	0.17791***	0.17697***	0.17719***
	[11.98]	[11.97]	[9.22]	[9.24]
size	0.00562***	0.00563***	0.00805***	0.00804***
	[4.44]	[4.43]	[4.87]	[4.86]
nim	-3.38648***	-3.37775***	-3.68994***	-3.69205***
	[-16.51]	[-16.41]	[-13.93]	[-13.91]
nwr	0.18509***	0.18447***	0.09427*	0.09396*
	[4.56]	[4.54]	[1.76]	[1.75]
npl	-0.13501	-0.13498	-0.28578*	-0.28464*
	[-1.22]	[-1.22]	[-1.92]	[-1.91]
ldr	0.00338	0.00354	-0.05137***	-0.05114***
	[0.36]	[0.38]	[-4.15]	[-4.12]
dgdp	0.00413***	0.00415***	0.00378***	0.00377***
	[7.11]	[7.11]	[5.27]	[5.24]
hpi	0.00341	0.00580	-0.01297	-0.01253
	[0.32]	[0.55]	[-0.91]	[-0.89]
unem	-0.00069	-0.00075	-0.00145	-0.00155
	[-0.67]	[-0.70]	[-1.02]	[-1.06]
pcpi	-0.00378	-0.00492	0.02953*	0.02851*
	[-0.30]	[-0.39]	[1.83]	[1.73]
hhi	0.07805*		0.00938	
	[1.87]		[0.18]	
rate	0.00019	0.00010	-0.01156***	-0.01162***
	[0.15]	[0.08]	[-7.00]	[-7.01]
crisis	-0.03931***	-0.03938***	-0.09013***	-0.08999***
	[-8.72]	[-8.68]	[-15.92]	[-15.82]
postcrisis	-0.01076*	-0.01053*	-0.04547***	-0.04505***
	[-1.89]	[-1.82]	[-6.08]	[-5.92]
est		-0.00184		0.00025
		[-1.05]		[0.11]
Constant	-0.11232	-0.08640	-0.31673**	-0.31018**
	[-1.01]	[-0.78]	[-2.22]	[-2.18]
Observations	4,507	4,507	3,545	3,545
R-squared	0.189	0.189	0.258	0.258
Adjusted R-squared	0.186	0.186	0.254	0.254
Ftest	61.62	61.45	71.97	71.97
Prob>F	0	0	0	0

Table 6.6 Regression analysis of changes in credit supply[12]

[12] The sample includes all the mergers and their matching pairs. dtl_1/dtl_2 represents for the change in total loans (credit supply) of a credit union between t-1 and t+1/t-1 and t+2. Independent variables are all measured in one year prior

Our results were in line with commercial bank studies by Ogura and Uchida (2013) and by Sapienza (2002), who found that bank mergers negatively affected credit supply for small banks since soft information deteriorated after a merger, and this decrease was especially severe for small borrowers.

Moreover, pre-merger characteristics also influence the change in credit supply. Decreases were achieved less with higher profitability (ROA), lower cost-efficiency (CI), larger size, narrower net interest margin (NIM) and better financial strength (NWR). Credit risk (NPL) and liquidity risk (LDR) were significant determinants of change in credit supply in the second year after the merger and they were negatively related to the increase of credit supply.

Table 6.7 reports the results of our regression analysis on the change in the loan portfolio, to examine our hypothesis 4. For the better exposition, we classified the table into three panels. Panel A reports the results of unsecured loans (ducc and doul) while Panel B presents the results of vehicle loans (dnvl and duvl). Results of real estate loans (dfm and dorel) and business loans (dbl) are shown in Panel C.

to the merger (t-1). Merger is a dummy variable that equals to 1 if credit union experienced a merger in that year and cross is a dummy variable that equals to 1 if the merger is a cross-state one. Roa is return on asset; ci is cost-income ratio, nwr is net worth ratio, nim is net interest margin, npl is non-performing loan ratio, ldr is loan-to-deposit ratio, size is natural logarithm of total asset,dgdp is GDP growth rate, hpi is housing price index, unem is unemployment rate, pcpi is per capita personal income, hhi is Herfindahl-Hirschman Index of deposits in each state, rate is interest rate, crisis is a dummy variable which is 1 for 2008-2010, postcrisis is a dummy variable which is 1 after 2010, and est is number of establishments in the state. T-statistics in brackets. *** p<0.01, ** p<0.05, * p<0.1

	change in unsecured credit cards				change in other unsecured loans			
VARIABLES	ducc_1	ducc_1	ducc_2	ducc_2	doul_1	doul_1	doul_2	doul_2
merger	-0.00086*	-0.00086*	-0.00051	-0.00052	0.00013	0.00013	0.00049	0.00049
	[-1.84]	[-1.83]	[-0.80]	[-0.82]	[0.12]	[0.13]	[0.36]	[0.36]
cross	0.00286*	0.00275*	0.00308	0.00313	-0.00750**	-0.00765**	-0.00742*	-0.00737*
	[1.88]	[1.81]	[1.51]	[1.53]	[-2.16]	[-2.21]	[-1.73]	[-1.72]
roa	-0.03163	-0.03396	-0.02956	-0.02794	-0.07587	-0.07907	-0.09532	-0.09334
	[-0.65]	[-0.70]	[-0.44]	[-0.42]	[-0.69]	[-0.71]	[-0.68]	[-0.67]
ci	-0.00669***	-0.00672***	-0.00314	-0.00309	0.00491	0.00488	0.01308*	0.01318*
	[-2.61]	[-2.62]	[-0.91]	[-0.90]	[0.84]	[0.83]	[1.80]	[1.82]
size	-0.00161***	-0.00158***	-0.00151***	-0.00152***	-0.00029	-0.00026	-0.00052	-0.00051
	[-7.35]	[-7.23]	[-5.09]	[-5.12]	[-0.59]	[-0.52]	[-0.82]	[-0.82]
nim	-0.12882***	-0.12440***	-0.15873***	-0.16106***	-0.12138	-0.11533	-0.54679***	-0.54620***
	[-3.64]	[-3.50]	[-3.33]	[-3.37]	[-1.51]	[-1.43]	[-5.46]	[-5.44]
nwr	0.00195	0.00197	0.01884*	0.01869*	0.04759***	0.04762***	0.00428	0.00420
	[0.28]	[0.28]	[1.95]	[1.93]	[2.98]	[2.98]	[0.21]	[0.21]
npl	0.00813	0.00773	0.03586	0.03626	-0.04569	-0.04626	-0.21711***	-0.21670***
	[0.43]	[0.41]	[1.34]	[1.35]	[-1.05]	[-1.07]	[-3.85]	[-3.84]
ldr	-0.00037	-0.00056	0.00306	0.00319	-0.00470	-0.00497	-0.00092	-0.00088
	[-0.23]	[-0.34]	[1.37]	[1.43]	[-1.27]	[-1.34]	[-0.20]	[-0.19]
dgdp	0.00015	0.00016	0.00007	0.00007	0.00011	0.00012	0.00001	0.00001
	[1.53]	[1.63]	[0.57]	[0.51]	[0.47]	[0.53]	[0.05]	[0.05]
hpi	0.00937***	0.00942***	0.01436***	0.01439***	0.00901**	0.00903**	0.00931*	0.00957*
	[5.07]	[5.14]	[5.60]	[5.66]	[2.14]	[2.16]	[1.73]	[1.79]
unem	0.00123***	0.00132***	0.00098***	0.00092***	0.00095**	0.00107**	0.00163***	0.00160***
	[6.94]	[7.14]	[3.82]	[3.48]	[2.34]	[2.55]	[3.02]	[2.88]
pcpi	-0.00258	-0.00183	-0.00603**	-0.00652**	-0.00527	-0.00418	-0.01408**	-0.01433**
	[-1.21]	[-0.84]	[-2.07]	[-2.20]	[-1.08]	[-0.84]	[-2.31]	[-2.30]
hhi	0.00284		-0.00198		0.00229		0.00786	
	[0.39]		[-0.21]		[0.14]		[0.40]	
rate	0.00029	0.00033	0.00018	0.00015	0.00015	0.00020	0.00100	0.00098
	[1.32]	[1.47]	[0.60]	[0.52]	[0.29]	[0.39]	[1.60]	[1.57]
crisis	0.00446***	0.00431***	0.00385***	0.00393***	0.00090	0.00070	0.00181	0.00183
	[5.73]	[5.51]	[3.78]	[3.83]	[0.51]	[0.39]	[0.84]	[0.85]
postcrisis	0.00276***	0.00244**	0.00282**	0.00303**	0.00334	0.00287	0.00512*	0.00521*
	[2.82]	[2.44]	[2.10]	[2.21]	[1.49]	[1.26]	[1.81]	[1.81]
est		-0.00047		0.00031		-0.00062		-0.00010
		[-1.56]		[0.77]		[-0.91]		[-0.12]
Constant	0.00844	0.00511	0.01497	0.01672	0.00930	0.00402	0.11217**	0.11499**
	[0.44]	[0.27]	[0.58]	[0.65]	[0.21]	[0.09]	[2.08]	[2.14]
Observations	4,507	4,507	3,545	3,545	4,507	4,507	3,545	3,545
R-squared	0.053	0.054	0.043	0.043	0.014	0.014	0.036	0.036
Adjusted R-squared	0.0499	0.0504	0.0387	0.0389	0.0103	0.0105	0.0315	0.0315
Ftest	14.92	15.06	9.395	9.429	3.757	3.805	7.783	7.774
Prob>F	0	0	0	0	2.73e-07	1.99e-07	0	0

Panel A. Regression analysis of changes in unsecured loans

	change in new vehicle loans				change in used vehicle loans			
VARIABLES	dnvl_1	dnvl_1	dnvl_2	dnvl_2	duvl_1	duvl_1	duvl_2	duvl_2
merger	0.00029	0.00030	-0.00179	-0.00170	-0.00258	-0.00259	-0.00092	-0.00094
	[0.18]	[0.18]	[-0.79]	[-0.75]	[-1.25]	[-1.25]	[-0.34]	[-0.35]
cross	0.00041	0.00050	0.00067	0.00047	0.00196	0.00244	0.00756	0.00783
	[0.08]	[0.09]	[0.09]	[0.07]	[0.29]	[0.36]	[0.88]	[0.91]
roa	0.53700***	0.53124***	0.17594	0.17011	0.04700	0.05103	-0.56585**	-0.55437**
	[3.10]	[3.07]	[0.75]	[0.72]	[0.22]	[0.24]	[-2.01]	[-1.97]
ci	0.02969***	0.02959***	-0.01290	-0.01290	0.00982	0.00984	0.01026	0.01089
	[3.25]	[3.24]	[-1.06]	[-1.06]	[0.87]	[0.87]	[0.70]	[0.74]
size	0.00323***	0.00327***	0.00181*	0.00189*	0.00138	0.00132	0.00286**	0.00287**
	[4.15]	[4.19]	[1.72]	[1.79]	[1.43]	[1.36]	[2.27]	[2.28]
nim	-0.22394*	-0.21152*	-0.18847	-0.16945	-0.04845	-0.05488	-0.07034	-0.06659
	[-1.78]	[-1.67]	[-1.12]	[-1.00]	[-0.31]	[-0.35]	[-0.35]	[-0.33]
nwr	0.02705	0.02657	-0.06670*	-0.06580*	0.04091	0.04046	0.07073*	0.07032*
	[1.08]	[1.06]	[-1.95]	[-1.93]	[1.32]	[1.31]	[1.73]	[1.72]
npl	0.07773	0.07726	-0.11923	-0.12087	-0.28588***	-0.28475***	-0.42675***	-0.42437***
	[1.15]	[1.14]	[-1.26]	[-1.28]	[-3.40]	[-3.39]	[-3.76]	[-3.73]
ldr	-0.03145***	-0.03156***	-0.03246***	-0.03330***	-0.04910***	-0.04847***	-0.05873***	-0.05851***
	[-5.43]	[-5.44]	[-4.13]	[-4.22]	[-6.84]	[-6.73]	[-6.23]	[-6.19]
dgdp	0.00128***	0.00131***	-0.00013	-0.00007	-0.00152***	-0.00154***	-0.00231***	-0.00230***
	[3.60]	[3.65]	[-0.28]	[-0.15]	[-3.43]	[-3.47]	[-4.22]	[-4.20]
hpi	-0.04399***	-0.04202***	-0.07603***	-0.07542***	-0.03922***	-0.03776***	-0.03243***	-0.03088***
	[-6.68]	[-6.43]	[-8.40]	[-8.40]	[-4.80]	[-4.66]	[-2.99]	[-2.87]
unem	-0.00056	-0.00050	-0.00136	-0.00102	0.00054	0.00025	0.00171	0.00159
	[-0.88]	[-0.76]	[-1.51]	[-1.09]	[0.68]	[0.31]	[1.58]	[1.42]
pcpi	0.02069***	0.02071***	0.01256	0.01546	-0.00347	-0.00633	-0.00622	-0.00761
	[2.72]	[2.67]	[1.22]	[1.48]	[-0.37]	[-0.66]	[-0.51]	[-0.61]
hhi	0.06569**		0.03891		0.04429		0.04640	
	[2.57]		[1.18]		[1.40]		[1.17]	
rate	-0.00533***	-0.00535***	-0.00950***	-0.00937***	0.00403***	0.00388***	0.00784***	0.00774***
	[-6.79]	[-6.80]	[-9.05]	[-8.90]	[4.14]	[3.97]	[6.23]	[6.13]
crisis	-0.02707***	-0.02730***	-0.03963***	-0.04012***	0.02093***	0.02129***	0.02914***	0.02928***
	[-9.77]	[-9.79]	[-11.00]	[-11.09]	[6.09]	[6.15]	[6.75]	[6.75]
postcrisis	-0.00760**	-0.00783**	-0.00267	-0.00396	0.03250***	0.03355***	0.04408***	0.04458***
	[-2.18]	[-2.20]	[-0.56]	[-0.82]	[7.50]	[7.60]	[7.73]	[7.68]
est		-0.00204*		-0.00258*		0.00007		-0.00061
		[-1.91]		[-1.83]		[0.06]		[-0.36]
Constant	-0.05718	-0.04064	0.26834***	0.26406***	0.21255**	0.23912***	0.17120	0.18750*
	[-0.84]	[-0.60]	[2.95]	[2.92]	[2.50]	[2.84]	[1.57]	[1.73]
Observations	4,507	4,507	3,545	3,545	4,507	4,507	3,545	3,545
R-squared	0.123	0.123	0.185	0.186	0.066	0.065	0.090	0.089
Adjusted R-squared	0.120	0.120	0.181	0.182	0.0621	0.0617	0.0852	0.0848
Ftest	37.20	37	47.12	47.27	18.54	18.42	20.41	20.33
Prob>F	0	0	0	0	0	0	0	0

Panel B. Regression analysis of change in vehicle loans.

VARIABLES	change in first mortgages				change in other real estate loans				change in business loans			
	dfm_1	dfm_1	dfm_2	dfm_2	dosel_1	dosel_1	dosel_2	dosel_2	dbl_1	dbl_1	dbl_2	dbl_2
merger	-0.00516**	-0.00514**	-0.00295	-0.00286	-0.00408***	-0.00409***	-0.00240	-0.00254	0.00045	0.00045	0.00087	0.00088
	[-2.35]	[-2.35]	[-0.97]	[-0.93]	[-2.76]	[-2.77]	[-1.19]	[-1.26]	[0.56]	[0.56]	[0.79]	[0.80]
cross	-0.00090	-0.00184	-0.00657	-0.00696	-0.00363	-0.00357	-0.00683	-0.00654	0.00097	0.00084	0.00049	0.00054
	[-0.13]	[-0.26]	[-0.06]	[-0.10]	[-0.76]	[-0.70]	[-1.06]	[-0.99]	[0.37]	[0.32]	[0.14]	[0.16]
roa	-0.45428**	-0.47404**	-0.85778***	-0.85247***	-0.18184	-0.17618	-0.16569	-0.14795	0.06465	0.05957	0.09258	0.09522
	[-2.00]	[-2.09]	[-2.64]	[-2.68]	[-1.19]	[-1.15]	[-0.79]	[-0.71]	[0.77]	[0.71]	[0.82]	[0.84]
ci	-0.04042***	-0.04064***	-0.04435***	-0.04487***	0.00669	0.00676	-0.01360	-0.01304	0.00493	0.00486	0.00642	0.00662
	[-3.37]	[-3.39]	[-2.69]	[-2.72]	[0.83]	[0.83]	[-1.25]	[-1.20]	[1.11]	[1.10]	[1.09]	[1.13]
size	0.00173*	0.00193*	0.00278*	0.00284**	0.00134*	0.00128*	0.00001	-0.00008	0.00342***	0.00346***	0.00342***	0.00344***
	[1.69]	[1.88]	[1.95]	[1.99]	[1.94]	[1.85]	[0.01]	[-0.09]	[6.41]	[6.51]	[6.74]	[6.77]
nim	0.49496***	0.53236***	0.66717***	0.68049***	0.29392***	0.28320**	0.44351***	0.42147***	-0.00047	0.00960	-0.02773	-0.02321
	[2.99]	[3.21]	[2.93]	[2.98]	[2.63]	[2.53]	[2.94]	[2.80]	[-0.01]	[0.16]	[-0.34]	[-0.28]
nwr	-0.06765**	-0.06749**	-0.08997*	-0.08885*	0.04291*	0.04287*	0.03019	0.02867	-0.02801**	-0.02812**	-0.03111*	-0.03108*
	[-2.06]	[-2.06]	[-1.95]	[-1.92]	[1.94]	[1.94]	[0.99]	[0.94]	[-2.32]	[-2.33]	[-1.89]	[-1.89]
npl	-0.00677	-0.01024	0.12823	0.12481	0.03960	0.04058	0.01267	0.01690	0.05050	0.04976	-0.04754	-0.04707
	[-0.08]	[-0.12]	[1.00]	[0.97]	[0.66]	[0.68]	[0.15]	[0.20]	[1.54]	[1.52]	[-1.04]	[-1.03]
ldr	-0.06747***	-0.06912***	-0.06843***	-0.06934***	-0.02737***	-0.02690***	-0.04554***	-0.04426***	-0.00643**	-0.00674**	0.00198	0.00190
	[-8.87]	[-9.08]	[-6.44]	[-6.50]	[-5.33]	[-5.23]	[-6.48]	[-6.29]	[-2.29]	[-2.40]	[0.53]	[0.50]
dgdp	0.00007	0.00017	0.00101	0.00105*	0.00100***	0.00098***	0.00104**	0.00097**	0.00004	0.00006	0.00002	0.00004
	[0.16]	[0.36]	[1.63]	[1.70]	[3.17]	[3.08]	[2.56]	[2.38]	[0.22]	[0.35]	[0.11]	[0.17]
hpi	-0.00314	-0.00293	0.02026*	0.01948	0.00871	0.00862	-0.00359	-0.00299	-0.00198	-0.00136	0.00059	0.00119
	[-0.56]	[-0.54]	[1.65]	[1.60]	[1.49]	[1.49]	[-0.44]	[-0.37]	[-0.62]	[-0.43]	[0.14]	[0.27]
unem	0.00201**	0.00277***	0.00295**	0.00333***	-0.00093*	-0.00115**	-0.00240***	-0.00295***	0.00070**	0.00083***	0.00162***	0.00164***
	[2.42]	[3.21]	[2.41]	[2.65]	[-1.67]	[-1.97]	[-2.97]	[-3.53]	[2.29]	[2.66]	[3.70]	[3.62]
pcpi	-0.00226	0.00440	-0.00013	0.00355	-0.00991	-0.01178*	-0.00969	-0.01466	0.00153	0.00268	0.00200	0.00206
	[-0.23]	[0.43]	[-0.01]	[0.25]	[-1.47]	[-1.72]	[-1.06]	[-1.57]	[0.42]	[0.71]	[0.40]	[0.41]
hhi	0.01697		-0.00527		-0.00582		-0.00843		0.02334*		0.02158	
	[0.50]		[-0.12]		[-0.26]		[-0.29]		[1.80]		[1.35]	
rate	0.00543***	0.00575***	0.00525***	0.00545***	-0.00105	-0.00114	-0.00440***	-0.00465***	0.00049	0.00053	0.00146***	0.00145***
	[5.27]	[5.57]	[3.70]	[3.82]	[-1.51]	[-1.63]	[-4.69]	[-4.94]	[1.28]	[1.40]	[2.89]	[2.86]
crisis	0.00701*	0.00576	-0.00082	-0.00137	-0.01938***	-0.01903***	-0.02537***	-0.02461***	-0.00144	-0.00172	-0.00255	-0.00259
	[1.93]	[1.57]	[-0.17]	[-0.28]	[-7.90]	[-7.70]	[-7.88]	[-7.62]	[-1.07]	[-1.27]	[-1.47]	[-1.49]
postcrisis	0.00628	0.00345	0.00033	-0.00120	-0.02121***	-0.02041***	-0.03193***	-0.02983***	-0.00542***	-0.00597***	-0.00616***	-0.00623***
	[1.37]	[0.74]	[0.05]	[-0.18]	[-6.85]	[-6.47]	[-7.52]	[-6.90]	[-3.20]	[-3.47]	[-2.68]	[-2.66]
est		-0.00388***		-0.00173		0.00112		0.00277**		-0.00127**		-0.00065
		[-2.76]		[-0.91]		[1.18]		[2.20]		[-2.44]		[-0.95]
Constant	0.06076	0.02942	-0.09234	-0.10974	0.04781	0.05637	0.16806**	0.18813**	-0.04497	-0.04543	-0.08908**	-0.08464*
	[0.68]	[0.33]	[-0.75]	[-0.90]	[0.79]	[0.94]	[2.07]	[2.33]	[-1.36]	[-1.38]	[-2.03]	[-1.94]
Observations	4,507	4,507	3,545	3,545	4,507	4,507	3,545	3,545	4,507	4,507	3,545	3,545
R-squared	0.029	0.031	0.023	0.023	0.064	0.064	0.093	0.094	0.020	0.021	0.034	0.034
Adjusted R-squared	0.0256	0.0272	0.0179	0.0181	0.0607	0.0609	0.0884	0.0897	0.0165	0.0171	0.0295	0.0292
Fitest	7.967	8.414	4.802	4.850	18.12	18.20	21.23	21.53	5.437	5.601	7.328	7.271
Prob>F	0	0	2.69e-10	1.93e-10	0	0	0	0	0	0	0	0

***p<0.01, ** p<0.05, * p<0

Panel C. Regression analysis of change in real estate loans and business loans

Table 6.7 Regression analysis of changes in loan portfolio[13]

13 The sample includes all the mergers and their matching pairs. dX_1/dX_2 represents for the change loan portfolio of

As shown in Panel A, compared to non-merging credit unions, acquirers' unsecured credit card loans (ducc_1) decreased more one year after the merger, but this effect seemed transitory. Additionally, compared with mergers that took place within the state, cross-state mergers faced less decrease in unsecured credit card loans in the first year after the merger (ducc_1) and more reduction in other unsecured loans for the first year and the second year after the merger (doul_1 and doul_2)[14]. This result was in line with the banking literature which argued mergers will negatively affect the credit supply of small banks due to deterioration in soft information. A cross-state merger definitely would lead to a decline in soft information and other unsecured loans rely heavily on that soft information. As such, we expected to observe a decrease in other unsecured loans more in a cross-state merger. Vehicle loan is an important loan category for credit unions, it is more so for smaller credit unions compared to larger ones. For vehicle loans (dnvl and duvl) shown in Panel B, we did not observe any impacts of mergers[15]. Results presented in Panel C indicated that the

a credit union between t-1 and t+1/t-1 and t+2. Xs are each loan type. ucc is unsecured credit card loans, oul is other unsecured loans, nvl is new vehicle loans, uvl is used vehicle loans, fm is first mortgages, orel is other real estate loans, bl is business loans. Independent variables are all measured in one year prior to the merger (t-1). Merger is a dummy variable that equals to 1 if credit union experienced a merger in that year and cross is a dummy variable that equals to 1 if the merger is a cross-state one. Roa is return on asset; ci is cost-income ratio, nwr is net worth ratio, nim is net interest margin, npl is non-performing loan ratio, ldr is loan-to-deposit ratio, size is natural logarithm of total asset,dgdp is GDP growth rate, hpi is housing price index, unem is unemployment rate, pcpi is per capita personal income, hhi is Herfindahl-Hirschman Index of deposits in each state, rate is interest rate, crisis is a dummy variable which is 1 for 2008-2010, postcrisis is a dummy variable which is 1 after 2010, and est is number of establishments in the state. T-statistics in brackets. *** p<0.01, ** p<0.05, * p<0.1

14 Further investigation beyond the second year (See Table A.8 Panel A) showed that there was no significant difference in either of these loan categories, i.e. all the impact on these loan categories seemed transitory.

15 When we extended our analysis to three years and five years after the merger, we found that (see Table A.8 Panel B), the acquiring credit unions decreased their credit supply to new vehicle loans compared to their peers three years after the merger. However, those results seemed transitory.

acquirers increased the proportion of first mortgages (dfm_1) less and decreased the proportion of other real estate loans (dorel_1) more in the portfolio for the first year after the merger, compared to non-merging credit unions. These impacts did not last longer than one year, though[16]. Moreover, contrast to previous studies on banks that found mergers generally decreased credit supply to small business loans (Berger et al., 1997; Haas et al., 2010), our results indicated that credit union merger events had no effects on business loans (dbl). And we did not find any difference between in-state mergers and out of state mergers in determining the change in neither real estate loans nor business loans[17].

To conclude, acquirers decreased proportions of both unsecured and collateralized loans more or increased these loans less. However, in all cases the changes in loan portfolios were transitory.

As the regression analysis shows, profitability decreases were more severe in merger activities in the first year, while they did not influence cost efficiency, as well as the average loan and deposit rates. Cross-state mergers also led to deterioration in cost efficiency and deposit interest rates. We also found that credit unions experiencing a merger would shrink their credit supply more and the impacts lasted at least for two years following the merger, although the magnitude got smaller in the second year. For loan portfolio, acquirers decreased their loan proportions for both unsecured loans and collateralized real estate loans more and increased first mortgage less, but the impacts did not last longer than one year. However, vehicle loans, which make up significant parts of loan portfolio across all sizes, were not influenced by the merger activities. Cross-state mergers, compared to those within the state, led to less decrease in unsecured credit card loans but higher reduction in

[16] When we extended our analysis beyond the second year, we did not find any difference from our original analysis for the first two years except for cross-state mergers, which increased credit supply to other real estate loans beyond 3 years after the merger (see Table A.8 Panel C).

[17] When we extended our analysis longer than the second year, we found acquirers increased business loans compared to peer credit unions those who did not experience any merger (see Table A.8 Panel C).

other unsecured loans.

6.4. Merger effects

We also conducted t-tests for merger effect. We first calculated the change in every dependent variable in the regressions, for every acquirer and their matched peer. Then changes of the matching group were subtracted from the changes of acquirers, and we defined this difference-in-difference as merger effects. T-tests were applied to these merger effects. Results are shown in Table 6.8.

Merger Effect				
	roa			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	2118	**-0.0004***	-1.93	0.0537
2yr	1625	0.000151	0.59	0.5556
	ci			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	2118	**0.00433****	2.01	0.0446
2yr	1625	0.00101	0.35	0.7246
	tl			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	2118	**-0.00935*****	-3.35	0.0008
2yr	1625	**-0.00675***	-1.82	0.0683
	ucc			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	2118	**-0.00089***	-1.85	0.065
2yr	1625	-0.00079	-1.22	0.2233
	oul			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	2118	-0.00041	-0.36	0.7203
2yr	1625	0.00105	0.76	0.4503
	nvl			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	2118	0.000841	0.5	0.616
2yr	1625	-0.00101	-0.42	0.6713
	uvl			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	2118	-0.0016	-0.74	0.4572
2yr	1625	0.000306	0.11	0.9144
	fm			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	2118	**-0.00515****	-2.29	0.0223
2yr	1625	-0.00394	-1.28	0.202
	orel			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	2118	**-0.00407*****	-2.72	0.0065
2yr	1625	-0.00224	-1.07	0.2862
	bl			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	2118	0.000431	0.52	0.6008
2yr	1625	0.000754	0.67	0.5011
	loan_rate			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	2118	-0.00004	-0.18	0.8534
2yr	1625	0.000211	0.8	0.4235
	depo_rate			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	2118	**-0.00041*****	-3.09	0.002
2yr	1625	-0.00026	-1.37	0.1699

Table 6.8 Merger effect[18]

As we can see from Table 6.8, compared to non-merging similar peers, acquirers

[18] Merger effect: the differences in changes of performance/credit supply/loan portfolio/average loan and deposit interest rate of the merged and the matching groups. We calculate the merger effect by subtracting matching groups' numbers from merger groups' numbers. *** p<0.01, ** p<0.05, * p<0.1

experienced less improvement in profitability and cost-efficiency for the first year after the merger. And there appeared no difference in the subsequent year. However, acquirers had a decrease in credit supply and this effect lasted for at least two years after the merger. Also, the first year after the merger, unsecured credit card loans and real estate loans all reduced at a higher rate in proportion in the loan portfolios, compared to non-merging credit unions. These effects were transitory, though. Meanwhile, acquirers' deposit interest rates deteriorated compared to non-merging counterparts. The results shown in Table 6.8 were in line with our regression analysis[19].

We also separated our sample into three periods: before the crisis, during the crisis and after the crisis. The results of merger effects during these three periods are reported in the Table A.1 to Table A.3.

[19] We also examine merger effects for three years after the merger and five years after the merger and report the results in Table A.9. Acquirers are shown to experience more increase in business loans but more decrease in deposit interest rates.

7. Discussion and Conclusion

Our study examined the impacts of merger activities in the U.S. on acquirer credit unions, to investigate whether members can get benefit from a merger event. The uniqueness of our study is that we are the first to investigate merger effects on benefits of members of the credit union. We examined the merger impacts on four aspects: performance indicators, average interest rates, credit supply and loan portfolio composition. A member can benefit if merger results in better performance (higher profitability or higher cost efficiency), extended credit supply, better interest rates on deposit or loan and richer array of financial products.

As acquirers are different from non-merging credit unions in size, profitability and cost efficiency, we argued that there may be possible selection bias if we simply compare the acquirer credit unions with all those who did not experience a merger. To mitigate this potential bias, we follow Behr and Heid (2011), applying propensity score matching, to match every acquirer with a similar non-merging peer based on credit union characteristic indicators and use the acquirer and its matching peer to form our data sample. Our sample includes mergers that took place between 2002 and 2015.

Compared with matched non-merging peers, acquirer credit unions went through a higher rate in profitability reduction in the first year after the merger, while cost efficiency showed no superior improvements. Acquirers did not perform better than their non-merging counterparts after a merger in profitability and cost efficiency. Cross-state mergers led to deterioration in cost efficiency. Also, we did not find any superior improvement on average interest rates, no matter for loan interest rates nor deposit interest rates. That is, members did not get any superior benefits on interests, in comparison to what they could receive if there was no merger. Cross-state mergers even led to worse deposit interest rates, as compared to mergers within the state. However, we found that acquirers reduced overall credit supply more as compared to the non-merging control group. This indicates that members even got worse off for at least up to two years after the merger: acquirer credit unions provided fewer loans than what they would do without a merger. We did not observe

any longer-than-one-year change in the loan portfolio composition following the merger. However, one year following merger we observed that members of acquirers received less availability to unsecured credit card loans and real estate loans. That is, members, compared to those of non-merging ones, had less access to diversified loan services. Cross-state mergers faced less decrease in unsecured credit card loans but more decrease in other unsecured loans. To conclude, we found that members did not obtain any advantages in the short term, compared to what they may expect without a merger. Part of this deterioration was relieved in the second year after the merger, though.

Then we are considering why credit unions still chose to conduct a merger if there were no benefits for their members. As mentioned by Bauer et al. (2009), there are three stakeholders of credit unions: members, management team and the regulators. Although members are shown to not benefit from the merger, we suspect the other two may be the gainers. Thus, we propose several possible reasons for conducting a merger.

Firstly, noticed by Bauer, Miles and Nishikawa (2009) that National Credit Union Share Insurance Fund is a co-insurance fund, where every member of this fund is jointly responsible for covering up any shortage without limit and a shortage may develop by failing credit unions. Such shortage has been developed in 2008 and it was reported that the average credit union had to bear a 62 basis points decline in the ROA (NCUA Letter to Credit Unions, 2009). Thus, acquirers may conduct a merger to save a failing credit union since it may be cheaper to merge and absorb the failing credit union than to let them fail. Secondly, many mergers may be forced and assisted with the help of the regulators to stabilize the whole industry. The improved CAMEL ratios are the benefits of regulators, confirmed in the study by Bauer, Miles and Nishikawa (2009). Thirdly, according to CUES Executive Compensation Survey Executive Summary [20], we observe an increase in compensation as the asset size of a credit union becomes larger. The report also summarized

[20] CUES executive compensation survey collects information about credit union executive compensation and the summary is a report that summarizes the data from the survey.

top performance measures to determine the CEO's bonus, among which, earnings, board evaluation, loan growth and membership growth drew our attention. Since merger activities will drive up the asset size and membership, which may bring potential benefit to managers via compensation; this is a conjecture based on year survey, though.

We have some limitations in our study. Firstly, we do not have access to managerial compensation data; thus, we cannot examine the merger impacts on the management team. Secondly, we only examine the impacts brought by one single merger event, but we do not research the impacts brought by multiple mergers. Moreover, we only emphasize on post-one-year and post-two-year impacts of mergers but do not investigate long-term impacts of such mergers. Also, we notice that in our sample, there are some acquiring credit unions whose return on asset ratio is less than zero and who are less than well-capitalized (net worth ratio less than 7% but greater than 6%), but we do not conduct studies on them separately. Thus, future studies can focus on the effect of the merger on managerial compensation if richer data on compensation is available and emphasize on examining the long-term benefits to members. Furthermore, separate studies can be conducted on those acquiring credit unions who are not profitable and/or less than well-capitalized. Impacts brought by multiple merger events should also be one focus in future studies.

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Appendix

Table A.1. Merger effect **before crisis**: the differences in changes of performance/credit supply/loan portfolio/average loan and deposit interest rate of the merged and the matching groups

We calculate the merger effect by subtracting matching groups' numbers from merger groups' numbers.

*** p<0.01, ** p<0.05, * p<0.1

Merger Effect (before crisis)				
	roa			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	982	-0.0005	-1.62	0.1047
2yr	817	0.000431	1.13	0.2584
	ci			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	982	**0.000782*****	2.87	0.0042
2yr	817	0.00298	0.76	0.4492
	tl			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	982	**-0.00943****	-2.17	0.0301
2yr	817	-0.00596	-1.08	0.2796
	ucc			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	982	-0.00016	-0.19	0.8507
2yr	817	-0.00145	-1.5	0.1349
	oul			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	982	-0.00277	-1.36	0.173
2yr	817	0.000476	0.24	0.8094
	nvl			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	982	0.00385	1.46	0.1437
2yr	817	-0.00092	-0.26	0.7975
	uvl			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	982	-0.00081	-0.25	0.802
2yr	817	0.00182	0.46	0.6445
	fm			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	982	-0.00311	-0.94	0.3462
2yr	817	0.00316	0.74	0.4611
	orel			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	982	**-0.00520*****	-2.23	0.0261
2yr	817	-0.00507	-1.62	0.1061
	bl			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	982	-0.00012	-0.11	0.9153
2yr	817	0.00102	0.72	0.4725
	loan_rate			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	982	-0.00007	-0.21	0.8328
2yr	817	0.000283	0.68	0.4968
	depo_rate			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	982	**-0.00051****	-2.25	0.025
2yr	817	**-0.00048***	-1.65	0.0997

Table A.2. Merger effect **during crisis**: the differences in changes of performance/credit supply/loan portfolio/average loan and deposit interest rate of the merged and the matching groups

We calculate the merger effect by subtracting matching groups' numbers from merger groups' numbers.

*** p<0.01, ** p<0.05, * p<0.1

Merger Effect (during crisis)				
	roa			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	432	-0.00087	-1.53	0.1271
2yr	352	0.000057	0.09	0.9264
	ci			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	432	**0.0105***	1.84	0.067
2yr	352	0.00253	0.39	0.7004
	tl			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	432	-0.00324	-0.54	0.5867
2yr	352	0.00178	0.24	0.8139
	ucc			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	432	**-0.00195****	-2.14	0.0332
2yr	352	0.000313	0.22	0.8281
	oul			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	432	0.0018	0.86	0.391
2yr	352	0.00361	1.39	0.1647
	nvl			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	432	0.00254	0.72	0.4719
2yr	352	0.00536	1.07	0.2863
	uvl			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	432	0.00222	0.51	0.6117
2yr	352	0.00581	0.99	0.3207
	fm			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	432	**-0.0116****	-2.21	0.0274
2yr	352	**-0.0213*****	-3.27	0.0012
	orel			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	432	0.000643	0.18	0.8541
2yr	352	0.00473	1.16	0.2477
	bl			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	432	0.00233	1.27	0.2061
2yr	352	-0.00034	-0.14	0.8922
	loan_rate			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	432	-0.00021	-0.47	0.6421
2yr	352	0.00026	0.5	0.6181
	depo_rate			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	432	-0.00049	-1.3	0.1945
2yr	352	0.000095	0.19	0.8516

Table A.3. Merger effect **after crisis**: the differences in changes of performance/credit supply/loan portfolio/average loan and deposit interest rate of the merged and the matching groups

We calculate the merger effect by subtracting matching groups' numbers from merger groups' numbers.

*** p<0.01, ** p<0.05, * p<0.1

Merger Effect (after crisis)				
	roa			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	704	0.000035	0.12	0.9019
2yr	456	-0.00028	-0.72	0.469
	ci			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	704	-0.00436	-1.13	0.2603
2yr	456	-0.00368	-0.68	0.4992
	tl			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	704	**-0.0130*** **	-2.87	0.0042
2yr	456	**-0.0147** **	-2.27	0.0238
	ucc			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	704	**-0.00127***	-1.85	0.0643
2yr	456	-0.00046	-0.44	0.6612
	oul			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	704	0.00152	1.04	0.2966
2yr	456	0.000117	0.04	0.9675
	nvl			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	704	-0.0044	-1.63	0.1033
2yr	456	-0.00610	-1.52	0.1296
	uvl			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	704	-0.00504	-1.33	0.1828
2yr	456	-0.00666	-1.17	0.2422
	fm			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	704	-0.00406	-1.07	0.2862
2yr	456	-0.00321	-0.53	0.5937
	orel			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	704	**-0.00539** **	-2.4	0.0167
2yr	456	-0.00253	-0.67	0.5035
	bl			

# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	704	0.000043	0.03	0.9766
2yr	456	0.00112	0.47	0.6414
	loan_rate			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	704	0.000115	0.39	0.696
2yr	456	0.000044	0.11	0.9136
	depo_rate			
# of yrs post-merger	N	Merger effect	t stats	p-value
1yr	704	**-0.00024****	-2.43	0.0155
2yr	456	-0.00013	-0.89	0.3713

Table A.4. Assess the matching quality (for studying post-3-yr change and post-5-yr change): compare main variables at t-1

tl_a is total loans, ucc is unsecured credit card loans, oul is other unsecured loans, nvl is new vehicle loans, uvl is used vehicle loans, fm is first mortgages, orel is other real estate loans, bl is business loans, roa is return on asset; ci is cost-income ratio, nwr is net worth ratio, nim is net interest margin, npl is non-performing loan ratio, ldr is loan-to-deposit ratio, size is natural logarithm of total asset, loan_rate is average loan rate, hhi is Herfindahl-Hirschman Index of deposits in each state, and depo_rate is average deposit rate.

PSM criteria: return on asset, cost-income ratio, net worth ratio, net interest margin, non-performing loan ratio, loan-to-deposit ratio, asset size and Herfindahl-Hirschman Index of deposits.

*** p<0.01, ** p<0.05, * p<0.1

acquirer	clean from pre 1yr to post 3yr				clean from pre 1yr to post 5 yr			
	N	Treated Mean	Matched mean	T stat of difference	N	Treated Mean	Matched mean	T stat of difference
roa	2085	0.00607	0.00613	0.25	1816	0.00592	0.00613	0.91
ci	2085	0.6594	0.6594	0	1816	0.6667	0.6671	0.07
nwr	2085	0.1186	0.1165	-1.82*	1816	0.1192	0.1182	-0.86
nim	2085	0.0383	0.0386	1.26	1816	0.038	0.0385	1.32
npl	2085	0.0137	0.0134	-0.8	1816	0.0138	0.0135	-0.66
ldr	2085	0.7184	0.7182	-0.03	1816	0.7122	0.7195	1.22
size	2085	18.1693	18.168	0.03	1816	18.0881	18.069	-0.39
hhi	2085	419.2	427.1	0.71	1816	417.5	409.9	-0.67

Table A.5. Regression analysis of changes in **performance (post-3-year and post-5-yr change)**

The sample includes all the mergers and their matching pairs. droa_3 (dci_3)/droa_5 (dci_5) represents for the change in roa (ci) of a credit union between t-1 and t+3/t-1 and t+5. Independent variables are all measured in one year prior to the merger (t-1). Merger is a dummy variable that equals to 1 if credit union experienced a merger in that year and cross is a dummy variable that equals to 1 if the merger is a cross-state one. Roa is return on asset; ci is cost-income ratio, nwr is net worth ratio, nim is net interest margin, npl is non-performing loan ratio, ldr is loan-to-deposit ratio, size is natural logarithm of total asset,dgdp is GDP growth rate, hpi is housing price index, unem is unemployment rate, pcpi is per capita personal income, hhi is Herfindahl-Hirschman Index of deposits in each state, rate is interest rate, crisis is a dummy variable which is 1 for 2008-2010, postcrisis is a dummy variable which is 1 after 2010, and est is number of establishments in the state. T-statistics in brackets.

VARIABLES	droa_3	droa_3	droa_5	droa_5	dci_3	dci_3	dci_5	dci_5
merger	-0.00034	-0.00034	-0.00017	-0.00017	0.00001	0.00002	0.00048	0.00033
	[-1.15]	[-1.15]	[-0.48]	[-0.48]	[0.00]	[0.01]	[0.10]	[0.07]
cross	-0.00040	-0.00040	0.00021	0.00013	0.02554**	0.02552**	0.03367**	0.03473**
	[-0.42]	[-0.43]	[0.18]	[0.12]	[2.24]	[2.23]	[2.06]	[2.13]
ci	0.01265***	0.01258***	0.01742***	0.01734***				
	[9.08]	[9.03]	[10.44]	[10.42]				
size	0.00020	0.00019	0.00020	0.00021	-0.00593***	-0.00590***	-0.01748***	-0.01769***
	[1.45]	[1.42]	[1.23]	[1.27]	[-3.67]	[-3.65]	[-7.66]	[-7.75]
nim	-0.16312***	-0.16407***	-0.23312***	-0.22970***	-0.48697*	-0.47403*	-3.67328***	-3.74807***
	[-7.99]	[-8.01]	[-9.40]	[-9.24]	[-1.91]	[-1.85]	[-10.36]	[-10.55]
nwr	-0.02824***	-0.02820***	-0.02978***	-0.02962***	0.07497	0.07478	0.09117	0.08688
	[-6.67]	[-6.66]	[-6.13]	[-6.10]	[1.44]	[1.44]	[1.31]	[1.25]
npl	0.07155***	0.07177***	0.10820***	0.10780***	1.16484***	1.16160***	1.22376***	1.23448***
	[5.95]	[5.97]	[7.14]	[7.12]	[7.87]	[7.85]	[5.63]	[5.69]
ldr	0.00231**	0.00233**	0.00573***	0.00561***	-0.05487***	-0.05516***	-0.00551	-0.00331
	[2.25]	[2.26]	[4.71]	[4.61]	[-4.44]	[-4.45]	[-0.32]	[-0.19]
dgdp	-0.00020***	-0.00020***	-0.00034***	-0.00034***	-0.00201***	-0.00198***	0.00211**	0.00215**
	[-3.33]	[-3.38]	[-4.76]	[-4.80]	[-2.79]	[-2.74]	[2.12]	[2.16]
hpi	-0.00504***	-0.00527***	0.00005	0.00011	0.06251***	0.06426***	0.10781***	0.10555***
	[-4.15]	[-4.37]	[0.04]	[0.07]	[4.26]	[4.41]	[5.16]	[5.08]
unem	0.00005	0.00004	0.00021	0.00029*	0.00479***	0.00493***	-0.00064	-0.00191
	[0.38]	[0.29]	[1.35]	[1.79]	[3.24]	[3.19]	[-0.29]	[-0.84]
pcpi	-0.00064	-0.00063	-0.00246	-0.00182	0.01495	0.01545	0.02665	0.01607
	[-0.47]	[-0.45]	[-1.46]	[-1.07]	[0.90]	[0.91]	[1.12]	[0.67]
hhi	-0.00806*		0.00189		0.06442		-0.09197	
	[-1.89]		[0.34]		[1.25]		[-1.18]	
rate	-0.00039***	-0.00039***	0.00094***	0.00098***	0.02765***	0.02767***	0.01227***	0.01158***
	[-2.98]	[-2.94]	[6.28]	[6.52]	[17.39]	[17.23]	[5.79]	[5.43]
crisis	0.00359***	0.00362***	0.00268***	0.00252***	0.11363***	0.11333***	0.08128***	0.08415***
	[8.05]	[8.04]	[5.10]	[4.75]	[20.94]	[20.71]	[10.90]	[11.15]
postcrisis	0.00081	0.00085	0.00480***	0.00450***	0.07182***	0.07131***	0.02813**	0.03332***
	[1.30]	[1.34]	[5.36]	[4.96]	[9.70]	[9.42]	[2.22]	[2.60]
est		0.00023		-0.00038*		-0.00214		0.00797***
		[1.25]		[-1.72]		[-0.95]		[2.59]
roa					3.59364***	3.58734***	3.49382***	3.53838***
					[11.75]	[11.71]	[8.20]	[8.31]
Constant	0.02554**	0.02348*	0.01260	0.00969	-0.39091***	-0.37761***	-0.32497	-0.29080
	[2.10]	[1.94]	[0.85]	[0.66]	[-2.66]	[-2.58]	[-1.55]	[-1.40]
Observations	2,882	2,882	1,906	1,906	2,882	2,882	1,906	1,906
R-squared	0.170	0.169	0.202	0.203	0.319	0.319	0.259	0.261
Adjusted R-squared	0.165	0.164	0.195	0.196	0.315	0.315	0.253	0.255
Ftest	36.58	36.42	29.86	30.09	83.96	83.90	41.28	41.73
Prob>F	0	0	0	0	0	0	0	0

*** p<0.01, ** p<0.05, * p<0.1

Table A.6. Regression analysis of changes in **loan/deposit interest rates (post-3-year and post-5-yr change)**

The sample includes all the mergers and their matching pairs. dloan_rate_3 (ddepo_rate_3)/dloan_rate_5 (ddepo_rate_5) represents for the change in average loan (deposit) interest rate of a credit union between t-1 and t+3/t-1 and t+5. Independent variables are all measured in one year prior to the merger (t-1). Merger is a dummy variable that equals to 1 if credit union experienced a merger in that year and cross is a dummy variable that equals to 1 if the merger is a cross-state one. Roa is return on asset; ci is cost-income ratio, nwr is net worth ratio, nim is net interest margin, npl is non-performing loan ratio, ldr is loan-to-deposit ratio, size is natural logarithm of total asset,dgdp is GDP growth rate, hpi is housing price index, unem is unemployment rate, pcpi is per capita personal income, hhi is Herfindahl-Hirschman Index of deposits in each state, rate is interest rate, crisis is a dummy variable which is 1 for 2008-2010, postcrisis is a dummy variable which is 1 after 2010, and est is number of establishments in the state. T-statistics in brackets.

VARIABLES	dloan_rate_3	dloan_rate_3	dloan_rate_5	dloan_rate_5	ddepo_rate_3	ddepo_rate_3	ddepo_rate_5	ddepo_rate_5
merger	-0.00047	-0.00047	0.00003	0.00004	-0.00028	-0.00028	**-0.00069****	**-0.00071****
	[-1.40]	[-1.40]	[0.08]	[0.09]	[-1.10]	[-1.12]	[-2.34]	[-2.40]
cross	-0.00101	-0.00100	0.00001	0.00005	-0.00231***	-0.00228***	-0.00312***	-0.00305***
	[-0.95]	[-0.93]	[0.01]	[0.04]	[-2.88]	[-2.84]	[-3.22]	[-3.15]
roa	0.09707***	0.09785***	0.10143**	0.10343**	0.30019***	0.30188***	0.18289***	0.18826***
	[2.82]	[2.84]	[2.34]	[2.38]	[11.64]	[11.70]	[5.90]	[6.07]
ci	0.01862***	0.01868***	0.01657***	0.01668***	0.02562***	0.02571***	0.01960***	0.01981***
	[9.84]	[9.88]	[6.90]	[6.94]	[18.07]	[18.14]	[11.40]	[11.55]
size	-0.00056***	-0.00056***	-0.00114***	-0.00114***	0.00031***	0.00030***	0.00055***	0.00054***
	[-3.61]	[-3.61]	[-5.96]	[-5.97]	[2.66]	[2.62]	[4.04]	[3.96]
nim	-0.39721***	-0.39762***	-0.36962***	-0.37155***	-0.17594***	-0.17755***	0.05223**	0.04558*
	[-15.65]	[-15.60]	[-11.36]	[-11.36]	[-9.24]	[-9.29]	[2.24]	[1.95]
nwr	0.02797***	0.02792***	0.02490***	0.02479***	0.00881**	0.00871**	-0.00096	-0.00128
	[5.75]	[5.73]	[4.30]	[4.27]	[2.41]	[2.39]	[-0.23]	[-0.31]
npl	0.01957	0.01962	0.01504	0.01547	0.02739**	0.02767***	-0.01506	-0.01390
	[1.37]	[1.37]	[0.81]	[0.83]	[2.55]	[2.58]	[-1.13]	[-1.05]
ldr	0.00587***	0.00590***	0.00272*	0.00277*	0.00619***	0.00628***	-0.00320***	-0.00304***
	[5.04]	[5.05]	[1.90]	[1.93]	[7.09]	[7.17]	[-3.13]	[-2.96]
dgdp	0.00061***	0.00061***	0.00034***	0.00034***	0.00048***	0.00048***	-0.00016***	-0.00016***
	[9.06]	[9.06]	[4.05]	[4.06]	[9.56]	[9.53]	[-2.71]	[-2.69]
hpi	0.00582***	0.00595***	0.00524***	0.00525***	-0.00082	-0.00068	-0.00846***	-0.00865***
	[4.24]	[4.36]	[3.02]	[3.04]	[-0.79]	[-0.66]	[-6.81]	[-7.01]
unem	0.00075***	0.00074***	0.00060***	0.00056***	0.00020**	0.00017	-0.00056***	-0.00065***
	[5.40]	[5.09]	[3.21]	[2.94]	[1.97]	[1.56]	[-4.21]	[-4.77]
pcpi	-0.00084	-0.00100	-0.00603***	-0.00630***	0.00150	0.00113	-0.00204	-0.00278*
	[-0.54]	[-0.63]	[-3.05]	[-3.14]	[1.29]	[0.95]	[-1.45]	[-1.94]
hhi	0.00399		0.00060		0.00360		-0.00766*	
	[0.83]		[0.09]		[0.99]		[-1.65]	
rate	-0.00065***	-0.00066***	-0.00076***	-0.00077***	-0.00301***	-0.00303***	-0.00194***	-0.00199***
	[-4.36]	[-4.39]	[-4.29]	[-4.36]	[-26.84]	[-26.78]	[-15.42]	[-15.70]
crisis	-0.00615***	-0.00614***	-0.00744***	-0.00737***	-0.01353***	-0.01349***	-0.01034***	-0.01013***
	[-12.12]	[-11.99]	[-12.02]	[-11.76]	[-35.54]	[-35.12]	[-23.35]	[-22.63]
postcrisis	-0.01037***	-0.01033***	-0.01180***	-0.01167***	-0.01342***	-0.01330***	-0.00466***	-0.00431***
	[-14.56]	[-14.20]	[-11.21]	[-10.94]	[-25.13]	[-24.39]	[-6.19]	[-5.65]
est		-0.00005		0.00012		0.00006		0.00059***
		[-0.22]		[0.49]		[0.38]		[3.20]
Constant	-0.02299*	-0.02115	0.04629***	0.04787***	-0.03043***	-0.02753***	0.04415***	0.04613***
	[-1.67]	[-1.54]	[2.66]	[2.77]	[-2.95]	[-2.68]	[3.54]	[3.74]
Observations	2,882	2,882	1,906	1,906	2,882	2,882	1,906	1,906
R-squared	0.222	0.222	0.249	0.249	0.552	0.552	0.517	0.519
Adjusted R-squared	0.218	0.218	0.242	0.242	0.550	0.550	0.513	0.515
Ftest	48.16	48.12	36.76	36.78	207.9	207.8	118.9	119.9
Prob>F	0	0	0	0	0	0	0	0

*** p<0.01, ** p<0.05, * p<0.1

Table A.7. Regression analysis of changes in **credit supply (post-3-year and post-5-yr change)**

The sample includes all the mergers and their matching pairs. dtl_3/dtl_5 represents for the change in total loans (credit supply) of a credit union between t-1 and t+3/t-1 and t+5. Independent variables are all measured in one year prior to the merger (t-1). Merger is a dummy variable that equals to 1 if credit union experienced a merger in that year and cross is a dummy variable that equals to 1 if the merger is a cross-state one. Roa is return on asset; ci is cost-income ratio, nwr is net worth ratio, nim is net interest margin, npl is non-performing loan ratio, ldr is loan-to-deposit ratio, size is natural logarithm of total asset,dgdp is GDP growth rate, hpi is housing price index, unem is unemployment rate, pcpi is per capita personal income, hhi is Herfindahl-Hirschman Index of deposits in each state, rate is interest rate, crisis is a dummy variable which is 1 for 2008-2010, postcrisis is a dummy variable which is 1 after 2010, and est is number of establishments in the state. T-statistics in brackets.

VARIABLES	dtl_3	dtl_3	dtl_5	dtl_5
merger	-0.00563	-0.00558	-0.00906	-0.00912
	[-1.32]	[-1.31]	[-1.54]	[-1.55]
cross	0.02768**	0.02746**	-0.00581	-0.00546
	[2.02]	[2.00]	[-0.30]	[-0.28]
roa	0.88627**	0.87279**	-1.91727***	-1.89340***
	[2.01]	[1.98]	[-3.11]	[-3.06]
ci	0.13974***	0.14008***	0.06159*	0.06256*
	[5.76]	[5.78]	[1.80]	[1.83]
size	0.01361***	0.01371***	0.01669***	0.01664***
	[6.88]	[6.93]	[6.12]	[6.10]
nim	-2.27763***	-2.24750***	-1.88134***	-1.91011***
	[-7.00]	[-6.88]	[-4.06]	[-4.10]
nwr	0.14282**	0.14308**	0.25062***	0.24921***
	[2.29]	[2.29]	[3.04]	[3.02]
npl	0.06425	0.05830	0.25792	0.26306
	[0.35]	[0.32]	[0.97]	[0.99]
ldr	-0.13353***	-0.13461***	-0.25713***	-0.25639***
	[-8.94]	[-8.98]	[-12.61]	[-12.55]
dgdp	0.00434***	0.00440***	-0.00090	-0.00089
	[5.01]	[5.07]	[-0.76]	[-0.75]
hpi	-0.03638**	-0.03422*	-0.08626***	-0.08702***
	[-2.07]	[-1.96]	[-3.49]	[-3.54]
unem	-0.00034	0.00016	-0.00668**	-0.00708***
	[-0.19]	[0.09]	[-2.52]	[-2.60]
pcpi	0.03679*	0.04027**	-0.03212	-0.03539
	[1.85]	[1.98]	[-1.14]	[-1.24]
hhi	0.09071		-0.02902	
	[1.46]		[-0.31]	
rate	-0.01952***	-0.01931***	-0.02169***	-0.02190***
	[-10.18]	[-9.97]	[-8.64]	[-8.67]
crisis	-0.08194***	-0.08280***	-0.04225***	-0.04136***
	[-12.58]	[-12.61]	[-4.80]	[-4.63]
postcrisis	-0.05460***	-0.05641***	-0.00365	-0.00207
	[-5.98]	[-6.05]	[-0.24]	[-0.14]
est		-0.00428		0.00247
		[-1.58]		[0.68]
Constant	-0.36242**	-0.35920**	0.71287***	0.72297***
	[-2.05]	[-2.05]	[2.88]	[2.94]
Observations	2,882	2,882	1,906	1,906
R-squared	0.246	0.246	0.262	0.262
Adjusted R-squared	0.242	0.242	0.255	0.255
Ftest	55.08	55.10	39.33	39.36
Prob>F	0	0	0	0

*** p<0.01, ** p<0.05, * p<0.1

Table A.8. Regression analysis of changes in **loan portfolio (post-3-year and post-5-yr change)**

The sample includes all the mergers and their matching pairs. dX_3/dX_5 represents for the change loan portfolio of a credit union between t-1 and t+3/t-1 and t+5. Xs are each loan type. ucc is unsecured credit card loans, oul is other unsecured loans, nvl is new vehicle loans, uvl is used vehicle loans, fm is first mortgages, orel is other real estate loans, bl is business loans. Independent variables are all measured in one year prior to the merger (t-1). Merger is a dummy variable that equals to 1 if credit union experienced a merger in that year and cross is a dummy variable that equals to 1 if the merger is a cross-state one. Roa is return on asset; ci is cost-income ratio, nwr is net worth ratio, nim is net interest margin, npl is non-performing loan ratio, ldr is loan-to-deposit ratio, size is natural logarithm of total asset,dgdp is GDP growth rate, hpi is housing price index, unem is unemployment rate, pcpi is per capita personal income, hhi is Herfindahl-Hirschman Index of deposits in each state, rate is interest rate, crisis is a dummy variable which is 1 for 2008-2010, postcrisis is a dummy variable which is 1 after 2010, and est is number of establishments in the state. T-statistics in brackets.

Panel A. Regression analysis of changes in unsecured loans

	change in unsecured credit cards				change in other unsecured loans			
VARIABLES	ducc_3	ducc_3	ducc_5	ducc_5	doul_3	doul_3	doul_5	doul_5
merger	0.00087	0.00086	0.00026	0.00030	0.00090	0.00089	0.00111	0.00121
	[1.03]	[1.01]	[0.19]	[0.22]	[0.52]	[0.51]	[0.44]	[0.48]
cross	0.00044	0.00050	-0.00164	-0.00128	-0.00737	-0.00726	-0.00435	-0.00339
	[0.16]	[0.18]	[-0.37]	[-0.29]	[-1.31]	[-1.29]	[-0.52]	[-0.41]
roa	-0.04306	-0.03927	0.29513**	0.31031**	-0.01379	-0.00728	0.18368	0.22555
	[-0.49]	[-0.45]	[2.07]	[2.18]	[-0.08]	[-0.04]	[0.69]	[0.85]
ci	-0.00480	-0.00460	-0.00031	0.00064	0.00300	0.00339	0.00423	0.00676
	[-1.00]	[-0.96]	[-0.04]	[0.08]	[0.30]	[0.34]	[0.29]	[0.46]
size	-0.00224***	-0.00225***	-0.00365***	-0.00367***	-0.00045	-0.00046	-0.00409***	-0.00414***
	[-5.71]	[-5.73]	[-5.80]	[-5.82]	[-0.55]	[-0.57]	[-3.48]	[-3.52]
nim	-0.22917***	-0.23278***	-0.48566***	-0.49900***	-0.51351***	-0.51880***	-0.86859***	-0.90652***
	[-3.55]	[-3.59]	[-4.55]	[-4.65]	[-3.84]	[-3.87]	[-4.36]	[-4.53]
nwr	0.02563**	0.02542**	0.03483*	0.03395*	0.05310**	0.05270**	0.06929*	0.06687*
	[2.07]	[2.05]	[1.83]	[1.78]	[2.07]	[2.06]	[1.95]	[1.88]
npl	0.08065**	0.08128**	0.07980	0.08297	0.06741	0.06830	-0.01145	-0.00269
	[2.22]	[2.23]	[1.31]	[1.36]	[0.90]	[0.91]	[-0.10]	[-0.02]
ldr	0.00489*	0.00509*	0.00934**	0.00972**	-0.00336	-0.00304	0.01180	0.01289
	[1.65]	[1.71]	[1.98]	[2.06]	[-0.55]	[-0.49]	[1.34]	[1.47]
dgdp	0.00028	0.00027	0.00037	0.00037	-0.00039	-0.00039	-0.00043	-0.00042
	[1.61]	[1.59]	[1.34]	[1.35]	[-1.10]	[-1.10]	[-0.85]	[-0.83]
hpi	0.02285***	0.02316***	0.02535***	0.02564***	0.00700	0.00771	0.01779*	0.01841*
	[6.55]	[6.68]	[4.45]	[4.52]	[0.97]	[1.07]	[1.67]	[1.74]
unem	0.00138***	0.00130***	0.00197***	0.00171***	0.00126*	0.00114	0.00118	0.00045
	[3.93]	[3.54]	[3.22]	[2.72]	[1.73]	[1.50]	[1.03]	[0.39]
pcpi	-0.01217***	-0.01300***	-0.00503	-0.00715	0.00777	0.00637	-0.00602	-0.01184
	[-3.09]	[-3.23]	[-0.78]	[-1.08]	[0.95]	[0.76]	[-0.50]	[-0.96]
hhi	0.00792		0.01308		0.01998		0.02883	
	[0.64]		[0.61]		[0.79]		[0.73]	
rate	0.00029	0.00024	0.00090	0.00076	-0.00049	-0.00058	0.00016	-0.00024
	[0.77]	[0.62]	[1.56]	[1.29]	[-0.62]	[-0.73]	[0.15]	[-0.22]
crisis	0.00808***	0.00819***	0.00557***	0.00604***	0.00469*	0.00485*	0.00924**	0.01056***
	[6.26]	[6.29]	[2.74]	[2.93]	[1.76]	[1.80]	[2.44]	[2.75]
postcrisis	0.00304*	0.00330*	-0.00574*	-0.00475	0.00263	0.00304	0.00568	0.00841
	[1.68]	[1.79]	[-1.66]	[-1.36]	[0.70]	[0.79]	[0.88]	[1.29]
est		0.00014		0.00072		0.00004		0.00217
		[0.26]		[0.85]		[0.03]		[1.38]
Constant	0.04662	0.05307	-0.01693	-0.00279	-0.10438	-0.09191	0.05144	0.08867
	[1.33]	[1.53]	[-0.30]	[-0.05]	[-1.44]	[-1.28]	[0.48]	[0.84]
Observations	2,882	2,882	1,906	1,906	2,882	2,882	1,906	1,906
R-squared	0.071	0.071	0.069	0.069	0.034	0.034	0.037	0.038
Adjusted R-squared	0.0651	0.0650	0.0604	0.0606	0.0283	0.0281	0.0282	0.0289
Ftest	12.81	12.79	8.205	8.227	5.941	5.904	4.252	4.336
Prob>F	0	0	0	0	0	0	1.33e-08	7.69e-09

*** p<0.01, ** p<0.05, * p<0.1

Panel B. Regression analysis of change in vehicle loans. (*** p<0.01, ** p<0.05, * p<0.1)

	change in new vehicle loans				change in used vehicle loans			
VARIABLES	dnvl_3	dnvl_3	dnvl_5	dnvl_5	duvl_3	duvl_3	duvl_5	duvl_5
merger	**-0.00558****	**-0.00547****	-0.00110	-0.00099	-0.00531	-0.00537	-0.00291	-0.00282
	[-2.06]	[-2.02]	[-0.28]	[-0.25]	[-1.57]	[-1.59]	[-0.60]	[-0.59]
cross	-0.00626	-0.00681	-0.00546	-0.00604	-0.00205	-0.00165	-0.00564	-0.00520
	[-0.72]	[-0.79]	[-0.42]	[-0.47]	[-0.19]	[-0.15]	[-0.36]	[-0.33]
roa	-0.52656*	-0.55978**	-0.74606*	-0.78839*	-0.07703	-0.05382	-0.05679	-0.04159
	[-1.88]	[-2.00]	[-1.81]	[-1.91]	[-0.22]	[-0.15]	[-0.11]	[-0.08]
ci	-0.05973***	-0.06016***	-0.07070***	-0.07233***	0.01787	0.01924	0.10556***	0.10671***
	[-3.89]	[-3.92]	[-3.10]	[-3.17]	[0.93]	[1.00]	[3.78]	[3.82]
size	0.00554***	0.00570***	0.00744***	0.00753***	0.00367**	0.00363**	0.00251	0.00250
	[4.42]	[4.55]	[4.08]	[4.13]	[2.34]	[2.31]	[1.12]	[1.12]
nim	0.78955***	0.84288***	0.43553	0.48782	-0.02769	-0.04723	-1.87481***	-1.88516***
	[3.83]	[4.07]	[1.41]	[1.57]	[-0.11]	[-0.18]	[-4.95]	[-4.96]
nwr	-0.05570	-0.05444	-0.03144	-0.02893	0.10686**	0.10545**	0.04867	0.04781
	[-1.41]	[-1.38]	[-0.57]	[-0.53]	[2.16]	[2.13]	[0.72]	[0.71]
npl	0.17587	0.16571	0.39569**	0.38654**	-0.01082	-0.00751	0.52471**	0.52782**
	[1.51]	[1.43]	[2.24]	[2.19]	[-0.07]	[-0.05]	[2.43]	[2.44]
ldr	-0.04407***	-0.04628***	-0.04398***	-0.04531***	-0.06736***	-0.06620***	-0.01913	-0.01880
	[-4.65]	[-4.88]	[-3.23]	[-3.33]	[-5.69]	[-5.57]	[-1.15]	[-1.13]
dgdp	-0.00170***	-0.00161***	-0.00307***	-0.00309***	-0.00077	-0.00077	-0.00062	-0.00061
	[-3.09]	[-2.93]	[-3.88]	[-3.90]	[-1.12]	[-1.12]	[-0.63]	[-0.63]
hpi	-0.11139***	-0.11002***	-0.13916***	-0.13762***	-0.02487*	-0.02249	0.04536**	0.04612**
	[-9.98]	[-9.94]	[-8.44]	[-8.39]	[-1.78]	[-1.62]	[2.25]	[2.29]
unem	-0.00193*	-0.00096	-0.00357**	-0.00286	0.00300**	0.00256*	0.00505**	0.00479**
	[-1.71]	[-0.81]	[-2.02]	[-1.58]	[2.14]	[1.74]	[2.33]	[2.15]
pcpi	0.03356***	0.04150***	0.07187***	0.07766***	0.00837	0.00335	-0.04916**	-0.05129**
	[2.67]	[3.22]	[3.83]	[4.08]	[0.53]	[0.21]	[-2.14]	[-2.20]
hhi	0.07932**		0.05956		0.06668		0.03223	
	[2.02]		[0.97]		[1.36]		[0.43]	
rate	-0.01001***	-0.00951***	-0.00894***	-0.00857***	0.00674***	0.00642***	0.00612***	0.00596***
	[-8.23]	[-7.76]	[-5.34]	[-5.09]	[4.43]	[4.18]	[2.98]	[2.89]
crisis	-0.02765***	-0.02917***	0.00302	0.00143	0.05351***	0.05408***	0.04572***	0.04614***
	[-6.70]	[-7.02]	[0.51]	[0.24]	[10.36]	[10.38]	[6.35]	[6.32]
postcrisis	0.01422**	0.01083*	0.04697***	0.04418***	0.05366***	0.05514***	0.02162*	0.02260*
	[2.46]	[1.83]	[4.70]	[4.36]	[7.41]	[7.45]	[1.77]	[1.82]
est		-0.00596***		-0.00461*		0.00027		0.00020
		[-3.47]		[-1.89]		[0.13]		[0.07]
Constant	0.14901	0.12521	-0.15117	-0.16708	-0.06181	-0.01833	0.20578	0.22462
	[1.33]	[1.13]	[-0.91]	[-1.02]	[-0.44]	[-0.13]	[1.02]	[1.12]
Observations	2,882	2,882	1,906	1,906	2,882	2,882	1,906	1,906
R-squared	0.201	0.203	0.153	0.154	0.115	0.115	0.102	0.102
Adjusted R-squared	0.196	0.198	0.146	0.147	0.110	0.110	0.0943	0.0942
Ftest	42.27	42.85	20.09	20.27	21.99	21.87	12.67	12.65
Prob>F	0	0	0	0	0	0	0	0

Panel C. Regression analysis of change in real estate loans and business loans

VARIABLES	change in first mortgages			change in other real estate loans			change in business loans		
	dfm_3	dfm_5	dfm_5	dorel_3	dorel_3	dorel_5	dbl_3	dbl_5	dbl_5
merger	-0.00242	-0.00232	-0.00049	-0.00015	-0.00022	-0.00068	-0.00066	0.00141	0.00143	0.00480**	0.00479**
	[-0.63]	[-0.60]	[-0.09]	[-0.06]	[-0.09]	[-0.19]	[-0.18]	[1.04]	[1.06]	[2.46]	[2.45]
cross	0.01146	0.01086	-0.00523	-0.00673	-0.00191	-0.00153	0.02309**	0.02408**	0.00062	0.00050	-0.00451	-0.00465
	[0.93]	[0.88]	[-0.29]	[-0.37]	[-0.24]	[-0.19]	[1.96]	[2.05]	[0.14]	[0.12]	[-0.70]	[-0.73]
roa	-0.53791	-0.57341	-0.95296*	-1.00785*	-0.14353	-0.12099	-0.39565	-0.34461	0.23545*	0.22873	0.11283	0.10648
	[-1.35]	[-1.44]	[-1.66]	[-1.75]	[-0.55]	[-0.46]	[-1.05]	[-0.92]	[1.69]	[1.64]	[0.53]	[0.52]
ci	-0.00699	-0.00837	-0.03823	-0.04213	-0.03627**	-0.03536**	-0.04719**	-0.04455**	0.02322***	0.02302***	0.05190***	0.05154***
	[-0.32]	[-0.38]	[-1.20]	[-1.32]	[-2.53]	[-2.48]	[-2.26]	[-2.14]	[3.02]	[3.00]	[2.81]	[2.78]
size	0.00247	0.00259	0.00317	0.00320	-0.00029	-0.00038	-0.00252	-0.00260	0.00536***	0.00539***	0.00891***	0.00892***
	[1.38]	[1.45]	[1.25]	[1.26]	[-0.25]	[-0.32]	[-1.51]	[-1.56]	[8.57]	[8.60]	[9.84]	[9.85]
nim	0.11537	0.15711	0.42652	0.46770	0.92352***	0.89433***	1.42706***	1.37408***	-0.07081	-0.06179	-0.00083	0.00535
	[0.39]	[0.53]	[0.99]	[1.08]	[4.80]	[4.63]	[5.06]	[4.85]	[-0.69]	[-0.60]	[-0.01]	[0.03]
nwr	-0.01340	-0.01160	-0.12377	-0.12064	-0.00456	-0.00562	0.01264	0.00966	-0.03184	-0.03153	-0.03383	-0.03347
	[-0.24]	[-0.21]	[-1.61]	[-1.57]	[-0.12]	[-0.15]	[0.25]	[0.19]	[-1.61]	[-1.60]	[-1.24]	[-1.22]
npl	-0.14498	-0.15258	-0.14177	-0.15306	-0.11855	-0.11315	-0.29104*	-0.28022*	-0.07454	-0.07622	-0.05477	-0.05610
	[-0.87]	[-0.92]	[-0.58]	[-0.62]	[-1.09]	[-1.04]	[-1.80]	[-1.74]	[-1.28]	[-1.31]	[-0.62]	[-0.64]
ldr	-0.03735***	-0.03938***	-0.08801***	-0.08929***	-0.05991***	-0.05856***	-0.05349***	-0.05205***	0.01074**	0.01033**	0.00634	0.00617
	[-2.77]	[-2.91]	[-4.64]	[-4.70]	[-6.78]	[-6.61]	[-4.31]	[-4.19]	[2.27]	[2.18]	[0.94]	[0.91]
depp	0.00088	0.00093	-0.00027	-0.00028	0.00031	0.00027	0.00083	0.00085	-0.00011	-0.00009	-0.00062	-0.00062
	[1.13]	[1.19]	[-0.24]	[-0.25]	[0.60]	[0.53]	[1.15]	[1.17]	[-0.39]	[-0.34]	[-1.56]	[-1.56]
hpi	0.02926*	0.02786*	0.05899**	0.05686**	0.00180	0.00219	-0.02265	-0.02294	0.00068	0.00003	-0.00456	-0.00459
	[1.84]	[1.76]	[2.57]	[2.48]	[0.17]	[0.21]	[-1.51]	[-1.53]	[0.01]	[0.00]	[-0.56]	[-0.56]
unem	0.00286*	0.00369**	-0.00706***	-0.00610**	-0.00269**	-0.00336***	-0.00117	-0.00204	0.00023	0.00040	-0.00089	-0.00078
	[1.79]	[2.21]	[-2.86]	[-2.41]	[-2.57]	[-2.97]	[-0.72]	[-1.23]	[0.40]	[0.68]	[-1.01]	[-0.87]
pcpi	-0.01631	-0.00827	-0.08266***	-0.07497***	-0.02209*	-0.02727**	-0.02670	-0.03375*	0.00397	0.00553	-0.01445	-0.01357
	[-0.91]	[-0.45]	[-3.16]	[-2.82]	[-1.88]	[-2.27]	[-1.56]	[-1.94]	[0.63]	[0.86]	[-1.55]	[-1.43]
hhi	-0.02028		-0.09206		-0.00574		-0.00780		0.00383		-0.00165	
	[-0.36]		[-1.07]		[-0.16]		[-0.14]		[0.20]		[-0.05]	
rate	0.00508***	0.00559***	0.00768***	0.00824***	-0.00636***	-0.00669***	-0.00768***	-0.00815***	0.00068	0.00078	0.00203**	0.00209**
	[2.95]	[3.20]	[3.29]	[3.51]	[-5.61]	[-5.84]	[-5.03]	[-5.30]	[1.12]	[1.27]	[2.44]	[2.50]
crisis	-0.00185	-0.00305	0.00968	0.00810	-0.03066***	-0.02983***	-0.02653***	-0.02479***	-0.00399*	-0.00425**	-0.00160	-0.00180
	[-0.31]	[-0.51]	[1.18]	[0.98]	[-7.96]	[-7.68]	[-4.95]	[-4.56]	[-1.94]	[-2.04]	[-0.55]	[-0.61]
posterisis	-0.00670	-0.00956	0.04583***	0.04226***	-0.03414***	-0.03219***	-0.04980***	-0.04646***	-0.00549*	-0.00608**	0.00150	0.00108
	[-0.81]	[-1.13]	[3.29]	[2.99]	[-6.32]	[-5.84]	[-5.46]	[-5.02]	[-1.90]	[-2.06]	[0.30]	[0.21]
est		-0.00302		-0.00137		0.00251		0.00382*		-0.00082		-0.00040
		[-1.23]		[-0.40]		[1.56]		[1.72]		[-0.95]		[-0.33]
Constant	0.01905	-0.02948	0.68842***	0.62633***	0.29286***	0.31957***	0.46073***	0.49560***	-0.14293**	-0.15043***	0.01387	0.00889
	[0.12]	[-0.19]	[2.99]	[2.74]	[2.81]	[3.08]	[3.05]	[3.31]	[-2.56]	[-2.71]	[0.17]	[0.11]
Observations	2,882	2,882	1,906	1,906	2,882	2,882	1,906	1,906	2,882	2,882	1,906	1,906
R-squared	0.013	0.014	0.042	0.041	0.108	0.109	0.118	0.119	0.053	0.053	0.084	0.084
Adjusted R-squared	0.00734	0.00782	0.0330	0.0325	0.103	0.103	0.110	0.111	0.0469	0.0472	0.0753	0.0753
Ftest	2.252	2.335	4.826	4.766	20.37	20.53	14.81	15.01	9.343	9.397	10.12	10.13
Prob>F	0.00235	0.00151	2.96e-10	4.44e-10	0	0	0	0	0	0	0	0

***p<0.01, ** p<0.05, * p<0

Table A.9. Merger effect: the differences in changes of performance/credit supply/loan portfolio/average loan and deposit interest rate of the merged and the matching groups

We calculate the merger effect by subtracting matching groups' numbers from merger groups' numbers.

*** p<0.01, ** p<0.05, * p<0.1

Merger Effect				
	roa			
# of yrs post-merger	N	Merger effect	t stats	p-value
3yr	1273	-0.00004	-0.11	0.9104
5yr	788	0.000113	0.3	0.7671
	ci			
# of yrs post-merger	N	Merger effect	t stats	p-value
3yr	1273	-0.00266	-0.72	0.4707
5yr	788	-0.00199	-0.38	0.7041
	tl			
# of yrs post-merger	N	Merger effect	t stats	p-value
3yr	1273	-0.00234	-0.52	0.6044
5yr	788	-0.00158	-0.23	0.8151
	ucc			
# of yrs post-merger	N	Merger effect	t stats	p-value
3yr	1273	0.000722	0.82	0.4103
5yr	788	0.000328	0.22	0.8256
	oul			
# of yrs post-merger	N	Merger effect	t stats	p-value
3yr	1273	-0.00031	-0.18	0.8554
5yr	788	-0.00002	-0.01	0.9939
	nvl			
# of yrs post-merger	N	Merger effect	t stats	p-value
3yr	1273	-0.00441	-1.6	0.1102

5yr	788	0.00209	0.5	0.619
	uvl			
# of yrs post-merger	N	Merger effect	t stats	p-value
3yr	1273	-0.00473	-1.36	0.1741
5yr	788	-0.00369	-0.71	0.4749
	fm			
# of yrs post-merger	N	Merger effect	t stats	p-value
3yr	1273	-0.003	-0.74	0.4595
5yr	788	0.00149	0.26	0.7956
	orel			
# of yrs post-merger	N	Merger effect	t stats	p-value
3yr	1273	-0.00051	-0.19	0.8472
5yr	788	0.00193	0.52	0.6029
	bl			
# of yrs post-merger	N	Merger effect	t stats	p-value
3yr	1273	0.000891	0.62	0.5321
5yr	788	**0.00444****	2	0.0461
	loan_rate			
# of yrs post-merger	N	Merger effect	t stats	p-value
3yr	1273	-0.00043	-1.35	0.1788
5yr	788	-0.00017	-0.38	0.7077
	depo_rate			
# of yrs post-merger	N	Merger effect	t stats	p-value
3yr	1273	-0.00015	-0.64	0.5227
5yr	788	**-0.00068****	-2.17	0.0305